4/1/89 - 04381 Option I 3F24 3.1

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D-33-11-8-19

DRAFT WORK PLAN
REVISION 1

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

DEPARTMENT OF THE NAVY
INSTALLATION RESTORATION PROGRAM
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA
SITES 5, 10, 16, AND 17

NUS CONTRACT NUMBER N62470-90-C-7635

APRIL 1989

(Updated MAY 1990)

NUS CORPORATION

INTERNAL CORRESPONDENCE

1355

C-49-08-90-88

TO: FILE

FROM: DEBRA WROBLEWSKI DMW

DATE: AUGUST 10, 1990

SUBJECT: CORRECTIONS TO WORK PLAN FOR SITES 5, 10, 16 AND 17

CC: V. BOMBERGER
J. ATKINSON
G. RUGGABER
A. KENDRICK

Attached is a telecopy from George Radford with specific corrections to the Work Plan for Sites 5, 10, 16 and 17, Revision 1 (updated May 1990). Also attached is a copy of a telecopy that I sent to Nina Johnson in response to George's corrections.

In addition to these telecopies, Nina stated during a phone call on July 31, 1990 that two additional wells are located at Site 16 (S3W2 and S3W3). One of the two wells is equipped with a continuous water level recorder; the other is to be sampled as part of our sampling program. Nina was not sure which well had the recorder.

DMW/pam

Attachments

ISSUED
AUG 14 1990

UNITED STATES MARINE CORPS
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA 28533-5001

1356

FACSIMILE TRANSMISSION

COVER SHEET

TOTAL NUMBER OF PAGES INCLUDING COVER SHEET 6

DATE 27 JUNE 90

TO:	FROM:
AGENCY: NUS CORP	AGENCY: FACDIR, NREA
NAME: [redacted]	NAME: GEORGE RADFORD
CODE:	CODE: (LN)
TELEPHONE NR: 412-788-4817	TELEPHONE NR: 919-466-4598/4599
RECEIVED:	
DATE:	
REMARKS:	

RE: RIFS WorkPlan
Sites 5, 10, 16, 17

Find enclosed corrections to plan. Also, recommend you check summaries of field sampling Tables, Lab Analysis Tables for # of samples.

Thanks,

-GWR

1357

TABLE 4-1b

SITE 5
CRITERIA FOR PLACEMENT OF BORINGS
MCAS, CHERRY POINT, NC

Boring Number	Rationale
5B01	Investigate potential source areas at Soil Gas Anomaly Sample Location No. 4.
5B02	Investigate potential source area between Soil Gas Anomaly Sample Location Nos. 14 and 15 (near vicinity of the Hazardous Waste Storage Area).
5B03	Investigate potential source area at Soil Gas Anomaly, Sample Location No. 82 (near vicinity of transformer station ~~western~~ EASTERN boundary).
5B04-5B07	Obtain soil samples around Tank 1771 for PCB analysis.
5B08-5B15	Obtain soil samples between Tank 1771 and Slocum Creek for PCB analysis.
5B16, 5B17	Obtain soil samples at the oil/water separator outfall.
5B18	Obtain background sample.

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In summary, the Phase I hydrogeologic investigation at Site 16 consists of the following activities:

- Survey the horizontal location and vertical elevation of the ground surface, the uncapped well riser, and the top of the protective casing of each of the monitoring wells to be installed during this investigation.

- Survey the horizontal locations and ground surface elevations of all the soil borings being placed within the site during the field Investigation, and survey all sediment sample locations.

- Drill, install, and sample seven mid-level (approximately 25 feet deep) monitoring wells.

- Drill borings to the water table at 10 soil gas anomaly areas.

- Perform synoptic water level measurements.

- Conduct slug tests at each well.

- Collect one round of groundwater samples at each newly Installed well.

- Resample the existing wells.

- Collect additional information to support the solute transport evaluation (i.e., staff gauges, Shelby tubes).

The rationale for locating the proposed monitoring wells is listed in Table 4-3. These locations, shown in Figures 4-4a and 4-4b, were selected based on the groundwater contour maps prepared for the Interim RI Report (NUS, November 1988) and the results of the soil gas survey (April 1990).

The proposed monitoring well borings at Site 16 will be drilled and sampled until the confining layer is encountered. The borings are estimated to be 40 feet deep (to the confining layer) for a total drilling footage of 280 feet. The borings will be backfilled with bentonite until the desired screened interval is reached. A monitoring well will then be constructed of 2-inch PVC well screen riser. Each monitoring well is estimated to be 25 feet deep with 15-foot-long wellscreens for a total estimated monitoring well footage of ~~100~~ 175 feet. After the wells have been installed and developed, a slug test will be completed in each well to determine the hydraulic conductivity of the aquifer around the well.

TABLE 4-5

SITE 5
PROPOSED SAMPLING PLAN
MCAS, CHERRY POINT, NC

Sample Matrix	Location/Depth	Number of Samples	Rationale
Groundwater	5GW01, 5GW02, 5GW03, 5GW04, 5GW05, 5GW07, 5GW08, 5GW09, 5GW10, and 5GW11	10 - 1 sample per well	Evaluate the presence and extent of volatiles/PCB contamination in the site shallow groundwater aquifer
Floating Product (Optional)	May be present at locations 5GW07, 5GW08, 5GW09, 5GW10, 5GW11	Up to 5 samples may be collected	Evaluate the nature of contamination
Soil	• 4 soil borings around Tank 1771, 2 soil borings at the oil/water separator location, and 1 upgradient location; samples collected every 2 1/2 ft depth down to 10 ft. 3 Borings at Soil Gas Anomalies • 8 soil borings ~~drilled~~ in drainage ditch from Tank 1771 to Slocum Creek - samples collected at 2-foot depth and above the water table.	• 28 - 4 per boring • 16 total - 2 per boring	Support closure for Tank 1771. Evaluate presence and extent of contamination at suspected hazardous waste source areas at Site 5. Also, evaluate extent of residual PCB contamination remaining after cleanup efforts by MCAS, Cherry Point. Collect data for evaluation of remedial alternatives.
Sediments	3 sampling locations: • Upgradient of oil/water separator outfall at Slocum Creek. • At discharge point of drainage oil/water separator outfall at Slocum Creek • Downgradient to oil/water separator outfall at Slocum Creek. 2 samples collected at each location on transect perpendicular to the bank of Slocum Creek at 2 feet and 4 feet from the edge of the bank	6 total	Investigate for PCB contamination possibly migrating to Slocum Creek via groundwater recharge of Slocum Creek or surface water runoff.

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D-33-11-8-19

DRAFT
WORK PLAN
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DEPARTMENT OF THE NAVY
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MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA
SITES 5, 10, 16, AND 17

NUS CONTRACT NUMBER N62470-90-C-7635

APRIL 1989

(Updated MAY 1990)

SUBMITTED FOR NUS BY:

Debra Wroblewski (VLB)

DEBRA WROBLEWSKI
PROJECT MANAGER

APPROVED:

Vicki L. Bomberger

VICKI L. BOMBERGER
PROGRAM MANAGER

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1.0 INTRODUCTION

1.1 PURPOSE

NUS Corporation (NUS) issued this Work Plan for a remedial investigation/feasibility study (RI/FS) for the Department of the Navy, Atlantic Division for the Marine Corps Air Station (MCAS), Cherry Point, Sites 5, 10, 16, and 17, in response to a request by the Department of the Navy, under Contract No. N62470-84-C-6886. The draft Work Plan was revised in May 1990 under Contract No. N62470-90-C-7635 and incorporates revisions to proposed monitoring well and boring locations as a result of findings presented in the April 1990 Soil Gas Survey Report.

The Work Plan is part of the ongoing Installation Restoration Program (IRP) at MCAS, Cherry Point, North Carolina. The first program objective was to collect and evaluate historical evidence indicating existence of pollutants that may have contaminated the installation or that pose an imminent health hazard on or off the facility. The Initial Assessment Study (IAS) (Water and Air Research, Inc., March 1983), which is essentially equivalent to a Preliminary Assessment conducted by the EPA under the Superfund Program, accomplished this goal by identifying 14 suspect sites. The second objective of the program was to determine via sampling and analysis activities whether specific toxic and hazardous materials identified in the IAS, and possibly other contaminants, exist in concentrations considered to be hazardous. The Remedial Investigation Interim Report (NUS, November 1988), known previously as the Verification Step Report, summarized the installation of monitoring wells; sampling and analysis of groundwater, soils, and sediments; and data evaluation. As a result, the report identified Sites 5, 10, 16, and 17 as contaminated and requiring additional work in the form of an RI/FS. In addition to the two documents described above, the Work Plan was developed from a scoping session held on August 29, 1988 with the Navy, as well as NUS internal brainstorming sessions held October 5, 1988 and October 10, 1988. Additional revisions were incorporated, following a Department of the Navy/NUS review meeting held March 29, 1989. Monitoring well installation and soil boring locations were finalized after review of the April 1990 Petrex Soil Gas Survey Report for Sites 5, 10, and 16.

This Work Plan presents the technical scope of work and schedule for performing the RI/FS. The work activities proposed in this document are based upon the data gaps identified after evaluating the results from previous sampling activities. The plan focuses on sampling and analytical efforts that will provide data to define present and future risks to human health and the environment as well as to evaluate potential remedial alternatives. For each site, a complete RI is planned in a phased effort, as required.

1.2 OBJECTIVES AND ORGANIZATION

The Work Plan is organized into five sections. This Introduction is Section 1.0. Section 2.0, Site Background Information, presents an overview of the Marine Corps Air Station (MCAS) at Cherry Point, North Carolina, and each of the four sites requiring RI/FS work. Section 3.0 discusses risk, engineering, and regulatory-related issues based on existing data; develops a list of data needs based on those discussions; formulates a list of RI objectives based on the data needs; and presents a set of field activities, organized by medium, to meet the RI objectives. Section 4.0 presents the RI/FS tasks necessary to implement the scope of work developed in Section 3.0. Finally, Section 5.0, Project Management Approach, discusses the project organization, quality assurance and data management, and schedule.

2.0 SITE BACKGROUND INFORMATION

This section provides a brief review of the history and description for Sites 5, 10, 16, and 17. The primary sources of this information are as follows:

- IAS Report (Water and Air Research, 1983).
- Remedial Investigation Interim Report (NUS, November 1988).
- Hydrogeologic Setting, Water Levels and Quality of Supply Wells at MCAS, Cherry Point (Lloyd and Daniel, 1988).
- Hydrogeologic and Water-Quality Data From Well Clusters Located Near the Wastewater Treatment Plant (Murray and Daniel, 1988).
- Results - Groundwater Assessment (Environmental and Safety Designs, Inc., 1988).
- Soil Sampling and Analysis, 100,000-Gallon Tank Site (General Engineering Laboratories, 1988).

2.1 SITE LOCATION AND DESCRIPTION

The Marine Corps Air Station (MCAS), Cherry Point is part of a military installation located in southeastern Craven County, North Carolina, just north of Havelock. The site is located on a 11,485-acre tract of land bounded on the north by the Neuse River estuary, the east by Hancock Creek, and the south by North Carolina Highway 101. The irregular western boundary line lies approximately 3/4-mile west of the Slocum Creek. The entire area is located on a peninsula with Core and Bogue Sounds to the south. Refer to the vicinity map shown in Figure 2-1, which also identifies outlying parts of the military installation, such as the Marine Corps Auxiliary Landing Field (MCALF) Bogue, Marine Corps Outlying Landing Field (MCOLF) Atlantic, and Point of Marsh Bombing Range.

Figure 2-2 presents a location map identifying the four sites of concern within the MCAS vicinity; Sites 5, 10, 16, and 17. The following subsections describe these specific sites.

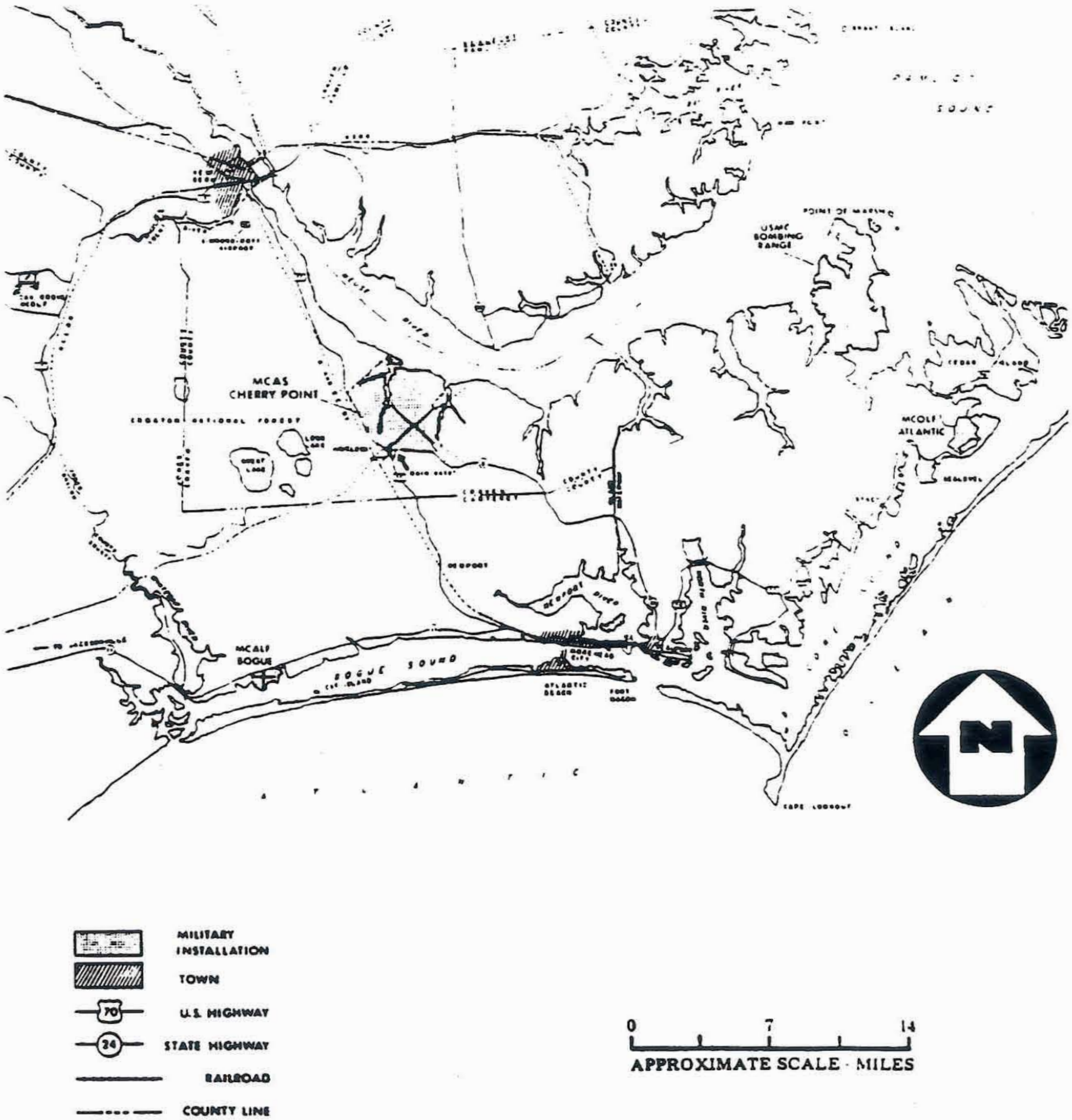


FIGURE 2-1

VICINITY MAP
MCAS CHERRY POINT, NC

NUS CORPORATION

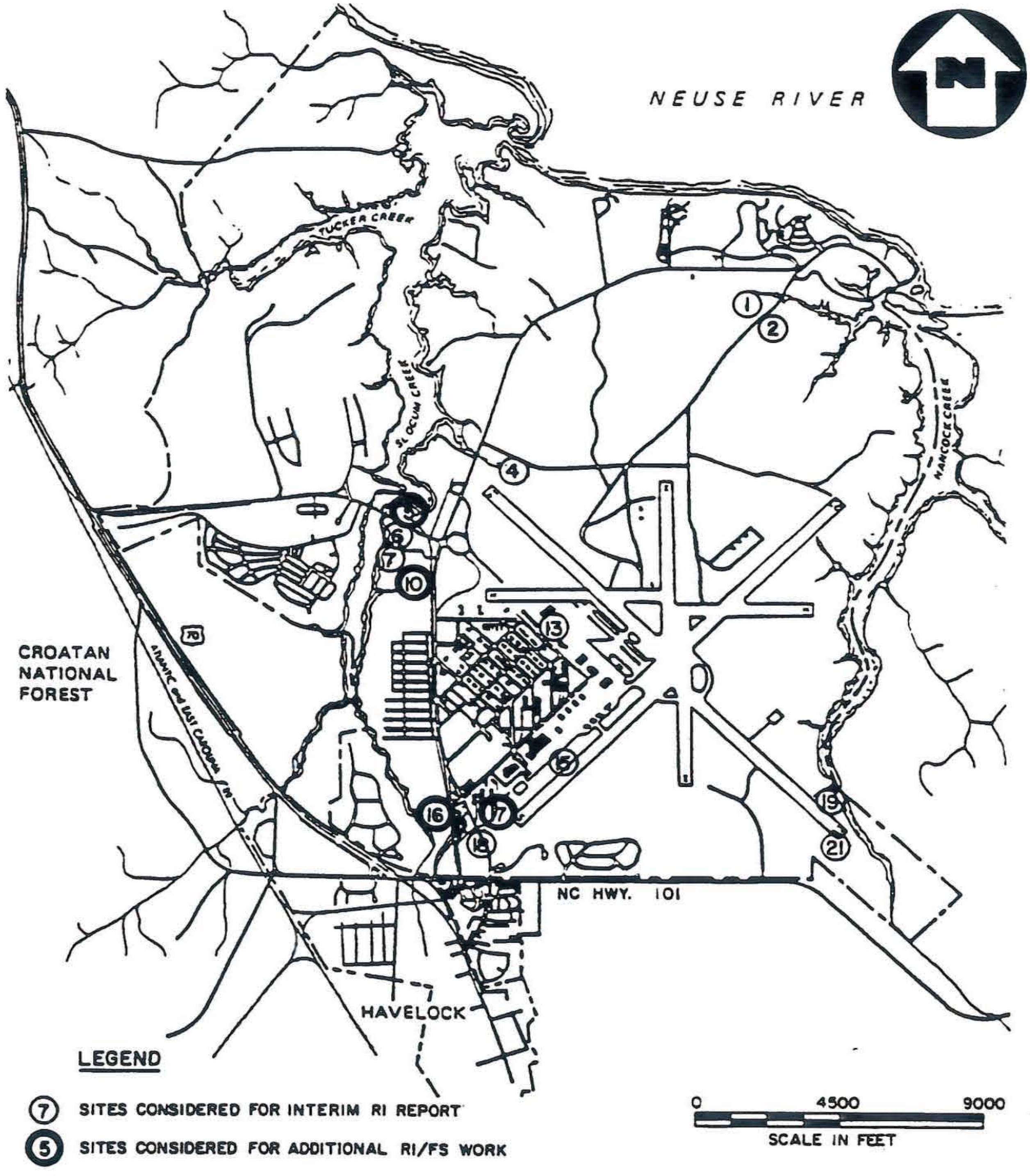
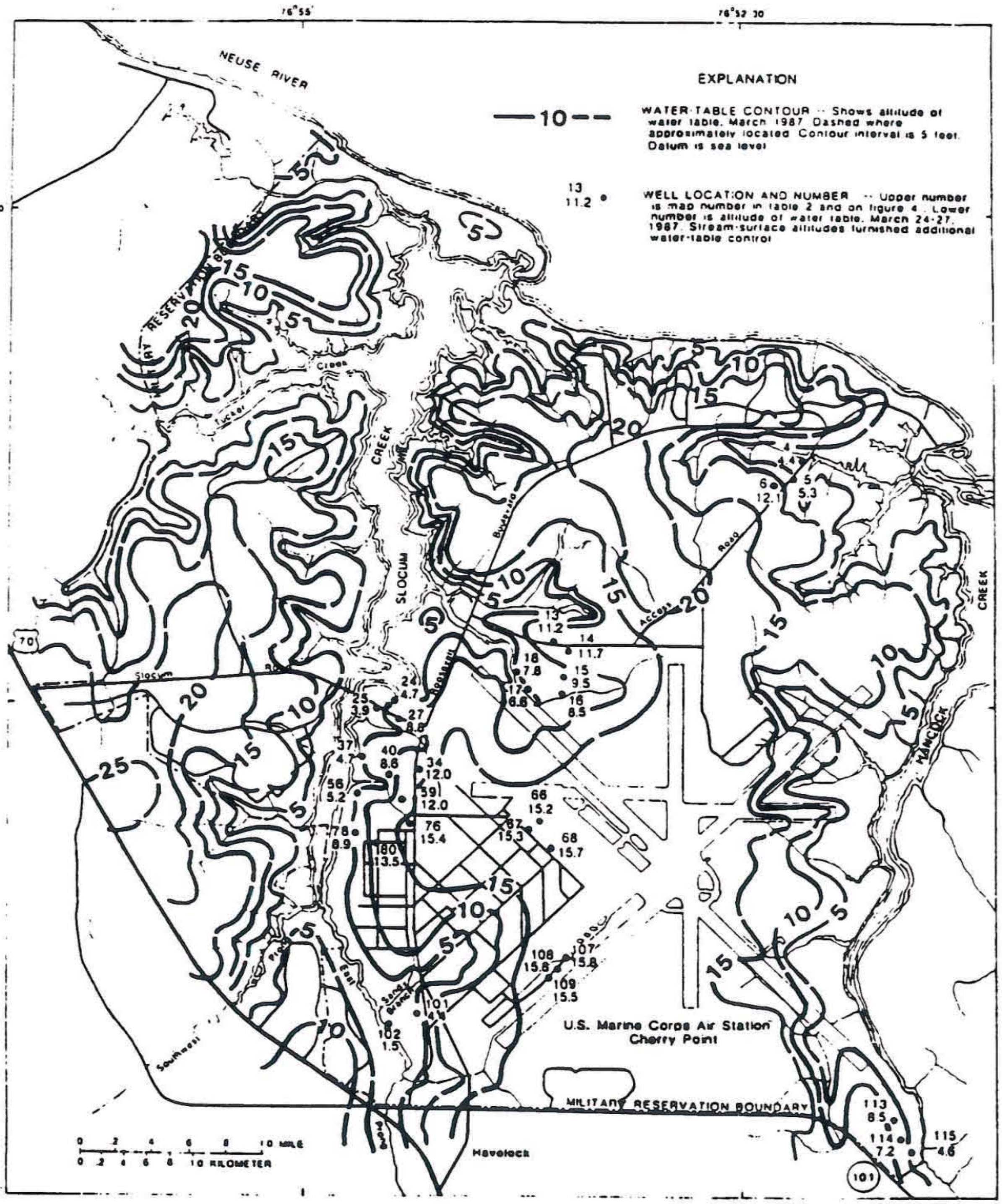


FIGURE 2-2

SITE LOCATION MAP
MCAS CHERRY POINT, NC

NUS CORPORATION



Note: Approximate water table elevations, U.S. Marine Corps Air Station, Cherry Point, North Carolina.
(Taken from U.S. Geological Survey, Water-Resources Investigations Report 88-4034, Lloyd, Jr., and Daniel, III, 1988).

FIGURE 2-8

APPROXIMATE WATER TABLE ELEVATIONS
MCAS CHERRY POINT, NC

NUS CORPORATION

Natural Resources and Community Development has classified Slocum Creek and Hancock Creek as SC estuarine waters. SC classification is defined as suitable for fish and wildlife propagation; secondary recreation (i.e., usage not involving whole body contact); and other uses requiring waters of lower quality. The Neuse River in the vicinity of MCAS Cherry Point is classified as SB estuarine waters, which includes primary recreation (whole body contact). A variety of freshwater and estuarine fish inhabit these streams and rivers (Water and Air Research, Inc., 1983).

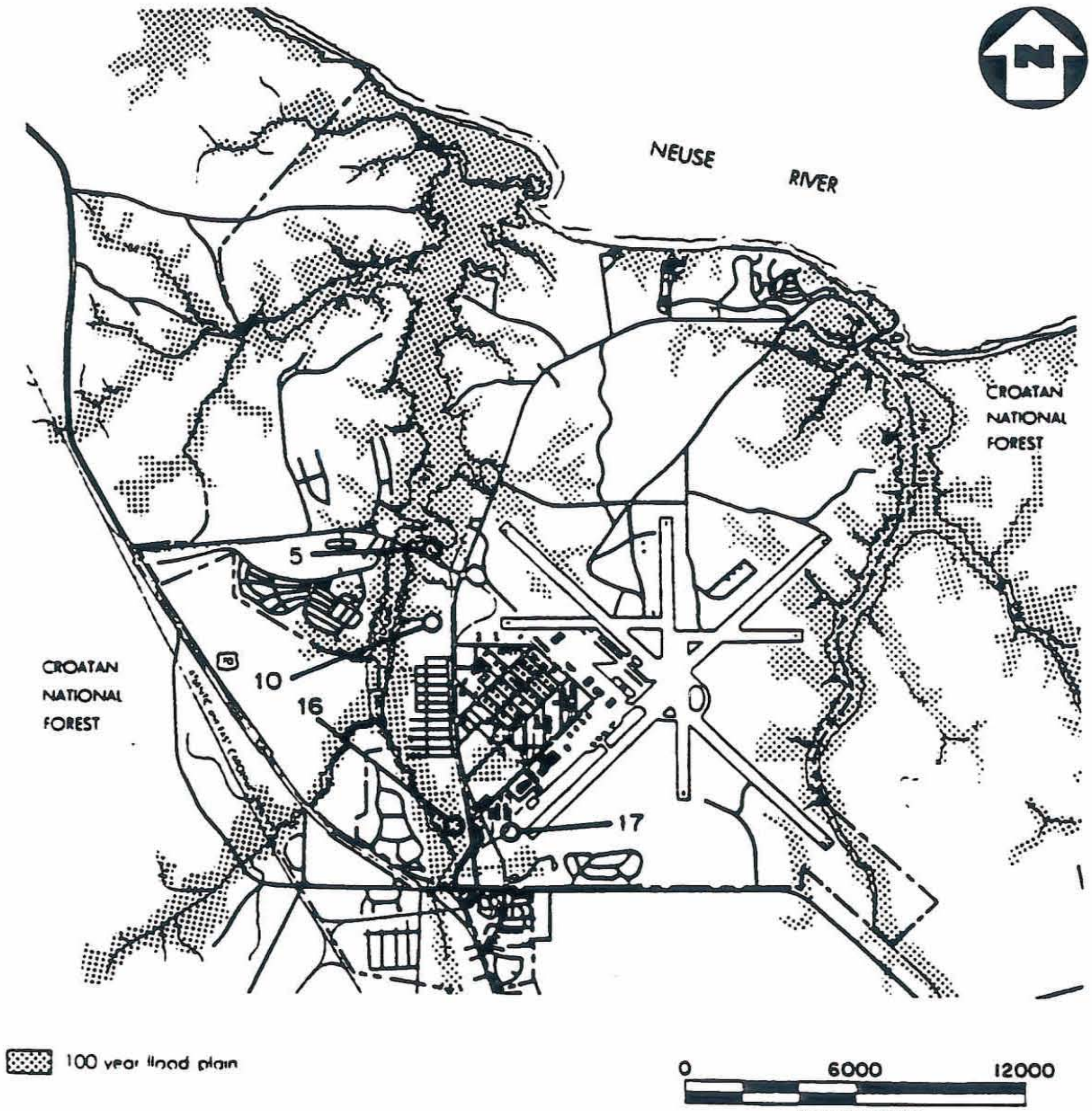
The water table fluctuates during wet and dry weather but usually remains close to the surface. Most excavations deeper than 3 feet require extensive dewatering. Figure 2-9 illustrates the flood prone areas for Cherry Point; these areas have a 1 in 100 chance of being inundated during any given year (Naval Facilities Engineering Command, September 1980). Sites 5 and 16 are located within the 100-year floodplain. Only a small portion of Site 10 and none of Site 17 are affected by this floodplain.

2.3.4 Climate

Proximity to the Atlantic Ocean significantly influences the climate of Craven County. The climate is warm and humid with short, mild winters and long, hot summers. Winter temperatures average 46°F; temperatures in summer average 77°F (Naval Facilities Engineering Command, September 1980). The average annual temperature is about 64°F. Periods of continuous freezing temperatures seldom last more than a few days. Precipitation is unevenly distributed, with the greatest monthly precipitation occurring during July, August, and September (6 to 8 inches per month). In the other months, rainfall averages 3 to 4 inches. Average annual precipitation in Craven County is approximately 55 inches (Floyd, 1969). In extremely dry years, rainfall may be as low as 35 inches; in very wet years, it may be 80 inches (Wilder et al., 1978). Tropical hurricanes pass offshore twice in an average year, but infrequently strike the coast with full force (Hardy, 1970). Average annual evapotranspiration is 36.8 inches (Floyd, 1969).

2.3.5 Population Distribution

MCAS, Cherry Point is located within the City of Havelock. The area surrounding the facility consists of commercial and residential developments, waterways, and public lands. It is isolated from relatively large population concentrations. The largest cities in the vicinity of MCAS, Cherry Point are the City of New Bern (approximately 19 miles northwest of the station) and Morehead City (approximately 19 miles southwest of the station). The estimated population within a 4-mile radius is 30,200 (approximately 21,000 MCAS, Cherry Point civilian and base personnel; City of Havelock, approximately 7,500; and the remainder estimated assuming a density of one person per acre).



NOTE: FLOOD PLAIN - MCAS CHERRY POINT (TAKEN FROM CHERRY POINT COMPLEX MASTER PLAN, NAVAL FACILITIES ENGINEERING COMMAND, SEPTEMBER 1980.)

FIGURE 2-9

FLOOD PLAIN MAP
MCAS CHERRY POINT, NC

NUS CORPORATION

The major military uses of land on the air station include operational and training, maintenance and production, supply, medical administration, troop and family housing, community support, and utilities. The most concentrated area of development occurs in an area bounded by "A" Street, Sixth Avenue, and Roosevelt Boulevard. Most of the assigned personnel, both civilian and military, work in this area, and most of the enlisted men's quarters are located here.

The area between the east prong of Slocum Creek and Roosevelt Boulevard and south of runway 14 is generally devoted to a Community Services complex. The southwest corner of the station is mainly housing. The northwest corner, along with the west bank of Slocum Creek, is primarily Ordnance and Survival Training Areas.

2.3.6 Potable Water Supply

Groundwater is the major source of drinking water in the vicinity of the installation. Groundwater use within the area includes domestic, light commercial, and industrial. Major public drinking water supply systems that use groundwater as a potable water supply source include MCAS Cherry Point and the City of Havelock. MCAS, Cherry Point relies solely on groundwater as a water supply source and presently uses between 2.5 and 4.5 M gal/day (Lloyd and Daniel, 1988). The water supply is obtained from approximately 20 wells that range from 195 to 330 feet in depth (Lloyd and Daniel, 1988). The number of wells used is dependent upon current water needs (Lloyd and Daniel, 1988). The City of Havelock obtains its water supply for approximately 7,500 residents from two wells that range in depth from 144 to 150 feet.

3.0 SCOPING OF REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

This Work Plan has been developed to present the technical scope of work for the Department of the Navy, MCAS, Cherry Point Sites 5, 10, 16, and 17. The scope of work must be adequate to meet the objectives of the RI/FS, which are to define the risks to public health and the environment as well as collect the data required to evaluate potential remedial alternatives.

The first part of this section presents a summary of existing data for the site. These data are then used to develop a preliminary risk assessment that briefly examines potential exposure pathways and evaluates the public health risks. Applicable state and Federal regulations and guidelines are used in conjunction with the results of the preliminary risk assessment to help determine appropriate remedial technologies.

In the evaluation of risks to public health and environment and of the remedial technologies, data gaps are identified and further developed as specific investigation objectives. The quantity of data to be collected and the associated quality requirements (e.g., data quality objectives) are defined in the final portions of this section.

3.1 SUMMARY OF EXISTING DATA (INTERIM RI)

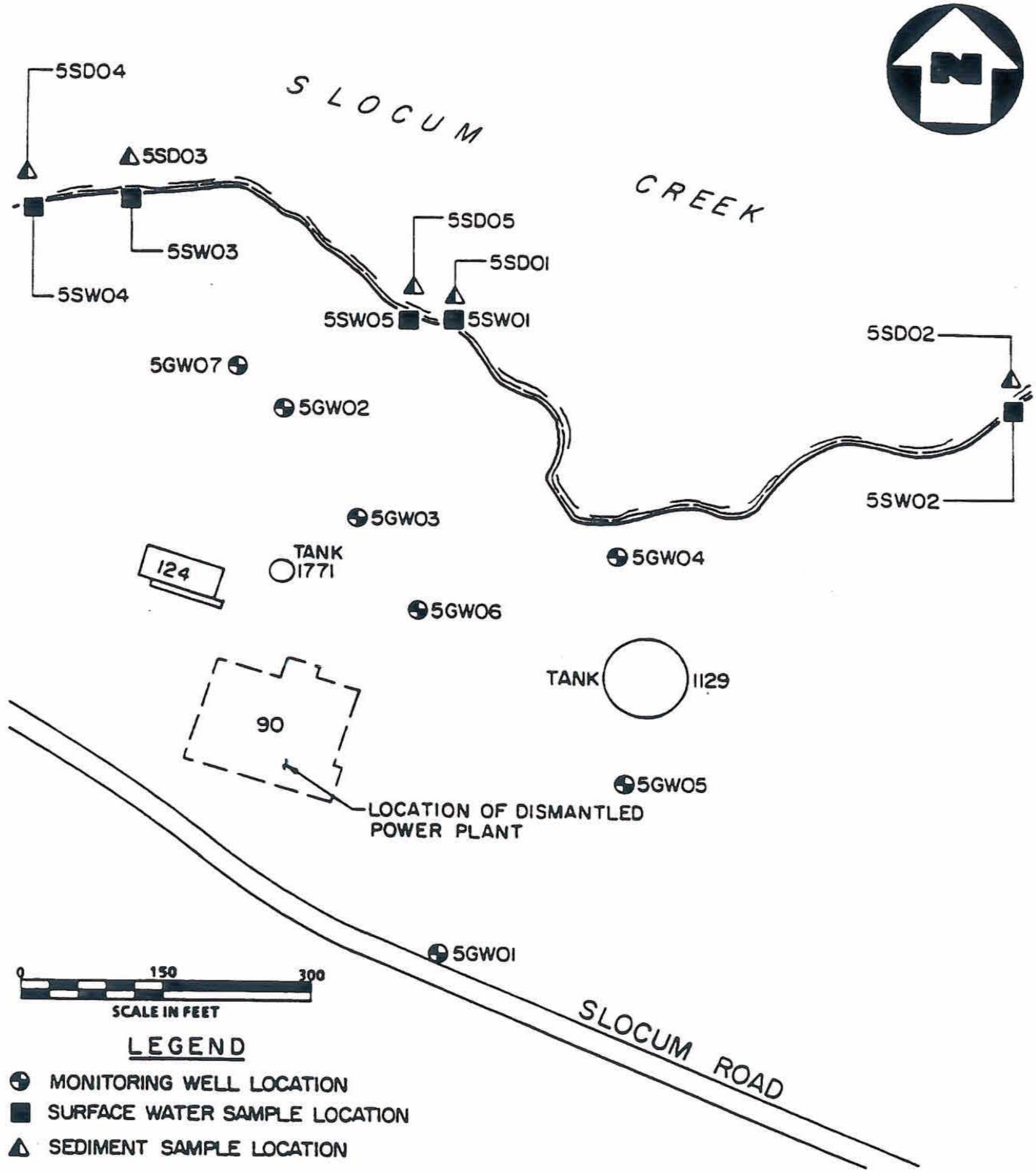
The previous investigation at MCAS, Cherry Point was essentially an interim RI which focused on whether any of the suspected 14 sites were contaminated. The environmental quality data that have been collected are summarized for each of the four sites (Sites 5, 10, 16, and 17) requiring additional investigation. More detailed information (e.g., well boring logs, raw analytical data) can be found in the Interim RI Report (NUS, November 1988).

3.1.1 Site 5 – Storage Tanks for Waste Petroleum, Oil, and Lubricant

3.1.1.1 Investigative Program

Monitoring Well Installation

Seven monitoring wells were installed at Site 5. The locations of Site 5 monitoring wells are shown in Figure 3-1.



SITE 5
INTERIM RI SAMPLING LOCATIONS
MCAS CHERRY POINT, NC

FIGURE 3-1

NUS CORPORATION

Number	Depth (feet)	Date Installed	Notes
5GW01	25	12/84	Upgradient Well
5GW02	25	12/84	Downgradient Tank 1771
5GW03	25	12/84	Downgradient Tank 1771
5GW04	25	12/84	Downgradient Tank 1129
5GW05	25	12/84	Adjacent to Tank 1129
5GW06	25	12/84	Between Tanks 1171 and 1129
5GW07	10	10/85	Shallow Well (piezometric surface) downgradient of Tank 1771

Six monitoring wells were installed during Round 1 activities. One well was placed upgradient of the site and the remaining wells located downgradient of or adjacent to the tanks. During Round 1 drilling activities, a 5-foot zone of sand banded with petroleum product was intersected between 0 feet and 5 feet in several borings. It was also determined that the water table was less than 10 to 15 feet deep. A shallow well (5GW07), screened to cross the water table and detect any products that may be floating on top of the water table, was installed downgradient of Tank 1771. This monitoring well was screened from 3 to 8 feet below land surface, with a water level 5 feet below ground surface.

Sample Collection and Analysis

Groundwater, surface-water, sediment, and soil samples were collected during Round 1, 2, and 3 activities. Samples collected and parameters analyzed are summarized in Table 3-1.

Wells 5GW01, 5GW02, 5GW03, 5GW04, 5GW05, and 5GW06 were sampled during Round 1 activities. One surface water (5SW01) and one sediment (5SD01) sample were also collected. The aqueous samples were analyzed for oil and grease (O&G), phenolics, lead, volatile organics, specific conductance, pH, total organic halogens (TOX), and total organic carbon (TOC). The Round 1 aqueous analysis was selected from the following: (1) contaminant indicator constituents such as TOC and TOX; (2) common waste contaminants such as volatile organics, and (3) suspect contaminants in the waste POL such as oil and grease, lead, etc. The sediment sample was analyzed for PCBs, which were suspected contaminants in the waste POL.

Wells 5GW01, 5GW02, 5GW03, 5GW04, 5GW05, 5GW06, and 5GW07 were sampled during Round 2 activities. One surface-water sample (5SW01) and one sediment (5SD01) sample were collected. The aqueous samples were analyzed for organic priority pollutants, EDB, MIBK, MEK, xylenes, PCBs, oil

TABLE 3-1

SITE 5
SAMPLE COLLECTION AND ANALYSIS
MCAS, CHERRY POINT, NORTH CAROLINA

Sample Location/ I.D. Number	PCB	Oil & Grease	Phenolics	Lead	GWCI	POL Layer	VOA	Organic Priority Pollutants	Ethylene Dibromide	GC Fuel	TCDD	Priority Pollutants[1]
Groundwater												
5GW01	1, 2, 3	1, 2, 3	1	1, 2	1	1, 2	1	2	2, 3	2		3
5GW02	1, 2, 3	1, 2, 3	1	1, 2	1	1, 2	1	2	2, 3	2		3
5GW03	1, 2, 3	1, 2, 3	1	1, 2	1	1, 2	1	2	2, 3	2		3
5GW04	1, 2, 3	1, 2, 3	1	1, 2	1	1, 2	1	2	2, 3	2		3
5GW05	1, 2, 3	1, 2, 3	1	1, 2	1	1, 2	1	2	2, 3	2		3
5GW06	1, 2, 3	1, 2, 3	1	1, 2	1	1, 2	1	2	2, 3	2		3
5GW07	2, 3	2, 3		2				2	2, 3	2		3
Surface Water												
5SW01	1, 2	1, 2	1	1, 2	1		1	2	2	2		
5SW02	3	3							3			3
5SW03	3	3							3			3
5SW04	3	3							3			3
5SW05	3	3							3			3

TABLE 3-1
SITE 5
SAMPLE COLLECTION AND ANALYSIS
MCAS, CHERRY POINT, NORTH CAROLINA
PAGE TWO

Sample Location/ I.D. Number	PCB	Oil & Grease	Phenolics	Lead	GWCI	POL Layer	VOA	Organic Priority Pollutants	Ethylene Dibromide	GC Fuel	TCDD	Priority Pollutants[1]
Sediment												
5SD01	1			2							2	
5SD02	3	3										3
5SD03	3	3		3								3
5SD04	3	3										3
5SD05	3	3										3

1,2,3: Sampling Round
GWCI: Groundwater Contaminant Indicators – pH, specific conductance, total organic carbon, total organic halogen
POL: Petroleum, oil and lubricant layer (thickness)
VOA: Volatile Organics
GC Fuel: Characterization of fuel component in groundwater by gas chromatograph.
TCDD: Gas chromatograph screening for dioxin

1 Includes MEK, MIBK, and xylenes

and grease, and lead. The groundwater samples were also compared to gas chromatograph fuel standards to identify fuel type. The sediment sample was analyzed for organic priority pollutants, MEK, MIBK, xylenes, PCB, lead, and dioxin. The volatile organic analysis was expanded to include the organic priority pollutant list, which is more comprehensive. Although PCBs were not detected in the Round 1 sediment sample, the high oil concentrations detected in all samples warranted continued PCB testing. Because the nature of the oil stored is unknown, dioxin (total TCDD) screening was conducted on the sediment sample.

Samples were collected from the seven monitoring wells during Round 3 activities. Four new surface water samples and four sediment samples were also collected. The number of surface water/sediment samples was increased because PCBs were detected in Round 2 samples. The aqueous samples were analyzed for priority pollutants, EDB, PCBs, oil and grease, MEK, MIBK, and xylenes. The sediment samples were analyzed for priority pollutants organics and metals, PCBs, oil and grease, MEK, MIBK, and xylenes. A full dioxin screen was performed on one sediment sample (5SD03). Round 3 analysis was expanded to include the more comprehensive priority pollutant list (i.e., includes MEK, MIBK, and xylenes). The dioxin screening was modified to more accurately screen and detect potential dioxin contamination.

3.1.1.2 Analytical Results

The 100,000-gallon Waste Oil Storage Tank 1771 utilized for used fuel and oil was first discovered to be a source of PCB contamination in January 1985, when PCBs were found by a company which purchased the used material for recycling purposes. The tank was subsequently cleaned and the contaminated material sent to a licensed PCB incineration facility. Suspicions were then raised about possible contamination from the oil/water separator, associated with the storage tank, discharging PCBs in its effluent flow overland toward Slocum Creek. Sampling in November and December 1985 revealed PCB concentrations of 1 to 20 ppm in the drainage ditch next to Slocum Creek and an isolated 100-square-foot flat area of the drainage ditch containing higher levels of PCB contamination (maximum 135 ppm). The contamination was limited to the upper 6 inches of the soil, based on cleaning the 1/4-acre site to a North Carolina PCB Soil Action Level of 5 ppm. Remediation consisted of scraping the resulting 200 cubic yards of contaminated earth from the site and placing this material in a plastic-lined berm. The PCB-contaminated material was later transported by truck to an approved disposal firm.

The chemical analytical results for Site 5 are shown in Table 3-2. Sample locations are shown in Figure 3-1.

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TABLE 3-2

SITE 5
CHEMICAL ANALYTICAL DATA
MCAS, CHERRY POINT, NC

Sample Number:	5GW01			5GW02			5GW03			5GW04			5GW05			5GW06		
Site Number:	5			5			5			5			5			5		
Sample Round:	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Date Sampled:	01/11/85	10/20/85	02/19/87	01/11/85	10/20/85	02/19/87	01/11/85	10/20/85	02/18/87	01/11/85	01/19/85	02/19/87	01/11/85	10/20/85	02/18/87	01/11/85	10/20/85	02/18/87
Sample Type:	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Volatiles																		
Chloroform																		
1,1-Dichloroethane				7 µg/l	5 µg/l	19 µg/l												
Trichloroethene																		
Inorganics																		
Arsenic						0 014 mg/l			0 004 mg/l									0 001 mg/l
Copper									0 06 mg/l						0 04 mg/l			0 02 mg/l
PCB-1260																		
Phenols						0 02 mg/l									0 03 mg/l			0 06 mg/l
Zinc			0 04 mg/l			0 03 mg/l			0 19 mg/l						0 06 mg/l			0 10 mg/l

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TABLE 3-2
SITE 5
CHEMICAL ANALYTICAL DATA
MCAS, CHERRY POINT, NC
PAGE TWO

Sample Number: / Site Number:	5GW01 / 5			5GW02 / 5			5GW03 / 5			5GW04 / 5			5GW05 / 5			5GW06 / 5		
Sample Round: / Date Sampled: / Sample Type:	1 / 01/11/85 / GW	2 / 10/20/85 / GW	3 / 02/19/87 / GW	1 / 01/11/85 / GW	2 / 10/20/85 / GW	3 / 02/19/87 / GW	1 / 01/11/85 / GW	2 / 10/20/85 / GW	3 / 02/18/87 / GW	1 / 01/11/85 / GW	2 / 01/19/85 / GW	3 / 02/19/87 / GW	1 / 01/11/85 / GW	2 / 10/20/85 / GW	3 / 02/18/87 / GW	1 / 01/11/85 / GW	2 / 10/20/85 / GW	3 / 02/18/87 / GW
Geochemical Parameters																		
pH	5 40	5.67	5 93	6 4	6 28	6 24	6 72	6 39	6 24	8 81	6 46	6 10	5 26	4 34	4 06	6 05	4 72	4 55
Specific Conductance (µmhos/cm)	580	320	220	700	605	480	890	695	700	260	295	220	300	240	180	560	400	320
Temperature (Celsius)	19°	19 4°	16 1°	17°	18 4°	12 5°	18°	19 5°	16 9°	19°	19 0°	15 4°	19°	19 0°	17 8°	18°	19 4°	17 2°
TOC	26 0 mg/l			43.4 mg/l			58 2 mg/l			19 1 mg/l			22 4 mg/l			20 0 mg/l		
OVA Reading							8 ppm									4 ppm		
TOX (as Cl)				13 µg/l						25 µg/l						13 µg/l		
Oil	1 2 mg/l	31 mg/l	5 6 mg/l				2 1 mg/l	7 7 mg/l		2 1 mg/l		3 8 mg/l	2.4 mg/l			8 7 mg/l	6 5 mg/l	
HNU Reading								9 ppm									2 ppm	
Static Water Level	18 80 ft	7 42 ft	8 58 ft	5.10 ft	4 57 ft	4 98 ft	7 17 ft	6 50 ft	6 92 ft	7 65 ft	9 59 ft	7 10 ft	11 85 ft	9 28 ft	10 41 ft	9 80 ft	8 69 ft	9.52 ft
Sampling Water Level	9 07 ft	9 18 ft		5 23 ft	6 06 ft		7 19 ft	18 18 ft		7 93 ft	18 76 ft		12 10 ft	9 89 ft		10 17 ft	9 12 ft	
Total Depth		26 73 ft	26 22 ft *		26 81 ft	26 52 ft *		26 68 ft	26 82 ft *		26 82 ft	26 19 ft *		26 50 ft	26 79 ft *		26 12 ft	27 30 ft *

TABLE 3-2
SITE 5
CHEMICAL ANALYTICAL DATA
MCAS, CHERRY POINT, NC
PAGE THREE

Sample Number: Site Number:	SGW07 5		SSW01 5		SSW02 5	SSW03 5	SSW04 5	SSW05 5	SSD01 5		SSD02 5	SSD03 5	SSD04 5	SSD05 5
Sample Round: Date Sampled: Sample Type:	2 10/20/85 GW	3 02/19/87 GW	1 01/11/85 SW	2 10/20/85 SW	3 03/03/87 SW	3 03/03/87 SW	3 03/03/87 SW	3 03/03/87 SW	1 01/11/85 SD	2 10/20/85 SD	3 03/03/87 SD	3 03/03/87 SD	3 03/03/87 SD	3 03/03/87 SD
Volatiles														
Chloroform	8 µg/l													
1,1-Dichloroethane		19 µg/l												
Trichloroethene	18 µg/l			5 µg/l										
Methylene Chloride												22 µg/kg	11 µg/kg	
Inorganics														
Arsenic		0.002 mg/l				0.001 mg/l		0.002 mg/l				7.8 mg/kg	0.3 mg/kg	0.2 mg/kg
Beryllium												1.2 mg/kg		
Cadmium												1.6 mg/kg		
Chromium												40 mg/kg	1 mg/kg	1 mg/kg
Copper											1 mg/kg	41 mg/kg	3 mg/kg	1.0 mg/kg
Cyanide, total (CN)					0.005 mg/l	0.011 mg/l	0.005 mg/l				0.7 mg/kg			
Lead										6 mg/kg		120 mg/kg	8 mg/kg	
Nickel												14 mg/kg		
PCB-1260	35 µg/l	1.1 µg/l										26,000 µg/kg		
Total PCBs in Sediment									0.96 µg/kg					
Phenols														

TABLE 3-2
SITE 5
CHEMICAL ANALYTICAL DATA
MCAS, CHERRY POINT, NC
PAGE FOUR

Sample Number: Site Number:	SGW07 5		SSW01 5		SSW02 5	SSW03 5	SSW04 5	SSW05 5	SSD01 5		SSD02 5	SSD03 5	SSD04 5	SSD05 5
Sample Round: Date Sampled: Sample Type:	2 01/19/85 GW	3 02/19/87 GW	1 01/11/85 SW	2 10/20/85 SW	3 03/03/87 SW	3 03/03/87 SW	3 03/03/87 SW	3 03/03/87 SW	1 01/11/85 SD	2 10/20/85 SD	3 03/03/87 SD	3 03/03/87 SD	3 03/03/87 SD	3 03/03/87 SD
Inorganics - Continued														
Selenium												0.6 mg/kg		
Zinc		0.08 mg/l									4 mg/kg	80 mg/kg	4 mg/kg	3 mg/kg
Geochemical Parameters														
pH	6.24	5.90		7.10	6.71	6.85	6.78	6.70						
Specific Conductance (µmhos/cm)	545	340		2,200	290	310	300	280						
Temperature (Celsius)	14.8°	11.3°	7°	13.0°	17.2°	17.2°	17.1°	17.2°						
TOC			22.7 mg/l											
OVA Reading														
TOX (as Cl)			59 µg/l											
Oil			4.2 mg/l	5.1 mg/l								0.1%	3.2%	
HNU Reading														
Static Water Level														
Sampling Water Level														
Total Depth	10.14 ft	11.24 ft *												

GW: Groundwater SW: Surface Water SD: Sediment
* From top of PVC pipe

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Compounds detected in surface water, sediments, and/or monitoring well samples include 1,1-dichloroethane, trichloroethene, chloroform, PCB-1260, oil, arsenic, beryllium, cadmium, chromium, copper, selenium, cyanide (total), lead, nickel, zinc, and phenols. PCB-1260 was detected in monitoring well 5GW07 (the shallow, water table well).

Tables 3-3 and 3-4 list the Site 5 pre-cleanup and post-cleanup PCB soil sample analyses collected by MCAS, Cherry Point, and NUS Corporation (NUS).

3.1.2 Site 10 – Old Sanitary Landfill

3.1.2.1 Investigative Program

Monitoring Well Installation

Table 3-5 lists all wells (newly installed and pre-existing wells) installed at Site 10 and appropriate technical specifications, where available.

Monitoring wells were installed at Site 10 as part of the verification step during three field events—Round 1 (12/84), Round 2 (4/86), Round 3 (10/86)—and in one additional event for the surface impoundment investigation. A total of 15 wells have been installed as listed on Table 3-6 and as shown on Figure 3-2.

Wells 10GW04, 10GW09, 10GW10, 10GW11, and 10GW12 are all shallow wells installed during Round 1 activities. The wells were located in areas where groundwater quality was unknown and to complement existing wells.

Wells 10GW14, 15, 16, 17, 18, 19, 21, 22, 23, and 24 were installed to investigate groundwater quality and hydrogeologic conditions upgradient and downgradient of the former surface impoundments. Several of these wells form clusters. Therefore, samples represent water quality from three zones in the water table aquifer and in the upper portion of the underlying confining aquifer. A detailed discussion of these wells and the hydrogeology of Site 10 in the vicinity of the former surface impoundments is presented in the January 1987 report entitled, "Report on Hydrogeology, Contaminants Detected and Corrective Action/Recommendations for the Former Surface Impoundments" (NUS, January 1987).

TABLE 3-3

SITE 5
PCB SOIL SAMPLE RESULTS
PRE-CLEANUP SAMPLES
MCAS, CHERRY POINT, NC

Date Sampled	Sample Number	Concentration (ppm)	Date Sampled	Sample Number	Concentration (ppm)
01-13-85	5SD01(1)	0.96(2)	01-03-86	C-1	<1
10-20-85	5SD01(1)	ND	01-03-86	C-2	<1
12-05-85	1	12	01-03-86	C-3	<1
12-05-85	2	<1	01-03-86	C-4	<1
12-05-85	3	32	01-03-86	C-5	<1
12-05-85	4	48	01-03-86	C-6	<1
12-05-85	5	11	01-03-86	C-7	<1
12-05-85	6	3	01-03-86	C-8	<1
12-05-85	7	4	01-03-86	C-9	<1
12-05-85	8	135	01-03-86	C-10	<1
12-05-85	9	14	01-03-86	D-1	2
12-05-85	10	<1	01-03-86	D-2	<1
12-18-85	A-1	6	01-03-86	D-3	<1
12-18-85	A-2	<1	01-03-86	D-4	<1
12-18-85	A-3	8	01-03-86	D-5	4
12-18-85	A-4	4	01-03-86	D-6	<1
12-18-85	A-5	<1	01-03-86	D-7	<1
12-18-85	A-6	<1	01-03-86	D-8	14
12-18-85	A-7	<1	01-03-86	D-9	<1
12-18-85	A-8	<1	01-03-85	D-10	<1
12-18-85	A-9	<1			
12-18-85	A-10	<1			
12-18-85	B-1	23			
12-18-85	B-2	<1			
12-18-85	B-3	<1			

TABLE 3-3
SITE 5
PCB SOIL SAMPLE RESULTS
PRE-CLEANUP SAMPLES
MCAS, CHERRY POINT, NC
PAGE 2

Date Sampled	Sample Number	Concentration (ppm)	Date Sampled	Sample Number	Concentration (ppm)
12-18-85	B-4	15			
12-18-85	B-5	11			
12-18-85	B-6	5			
12-18-85	B-7	9			
12-18-85	B-8	4			
12-18-85	B-9	3			
12-18-85	B-10	16			

Notes: (1) NUS Corporation samples; Round 1 and Round 2 Monitoring. Remaining samples collected by MCAS, Cherry Point.
(2) PCB-1260

Source: MCAS, Cherry Point, Natural Resources and Environmental Affairs Division, 1985.

TABLE 3-4

SITE 5
PCB SOIL SAMPLE RESULTS
POST-CLEANUP SAMPLES
MCAS, CHERRY POINT, NC

Round 1 Sampling[1]			Round 2 Sampling		
Date Sampled	Sample Number (Round 1)	Concentration (ppm)	Date Sampled	Sample Number (Round 2)	Concentration (ppm)
01-13-86	E-1	3	01-23-86	H-1	<1
01-13-86	E-2	<1	01-23-86	H-2	<1
01-13-86	E-3	<1	01-23-86	H-3	4
01-13-86	E-4	<1	01-23-86	H-4	<1
01-13-86	E-5	2	01-23-86	H-5	<1
01-13-86	E-6	2	01-23-86	H-6	<1
01-13-86	E-7	4	01-23-86	H-7	<1
01-13-86	E-8	6	01-23-86	H-8	<1
01-13-86	E-9	<1	01-23-86	H-9	<1
01-13-86	E-10	12			
01-13-86	F-1	16			
01-13-86	F-2	<1			
01-13-86	F-3	<1			
01-13-86	F-4	<1			
01-13-86	F-5	<1			
01-13-86	F-6	<1			
01-13-86	F-7	2			
01-13-86	F-8	3			
01-13-86	F-9	11			
01-13-86	F-10	5			

Notes:

(1) Additional soil was removed following MCAS Cherry Point Post-Cleanup (Round 1) sampling and analysis.

Sources: MCAS Cherry Point, Natural Resources and Environmental Affairs Division, 1985.

TABLE 3-10

SITE 16
SAMPLE COLLECTION AND DATA ANALYSIS
MCAS, CHERRY POINT, NC

	GWCI	Phenolics	Metals	VOA	PP(1)	Cr^{+6}	CN	EDB
GROUNDWATER								
16GW01	1	1	1	1	2,3	2,3	2,3	2,3
16GW02	1	1	1	1	2,3	2,3	2,3	2,3
16GW03	1	1	1	1	2,3	2,3	2,3	2,3
16GW04	1	1	1	1	2,3	2,3	2,3	2,3
16GW05					2,3	2,3	2,3	2,3
16GW06					2,3	2,3	2,3	2,3
16GW07					3	3	3	3
16GW08					3	3	3	3
16GW09					3	3	3	3
SEDIMENT								
16SD01					3	3	3	3
16SD02					3	3	3	3
16SD03					3	3	3	3
SURFACE WATER								
16SW01					3	3	3	3
16SW02					3	3	3	3
16SW03					3	3	3	3

1,2,3: Sampling Round
GWCI: Groundwater Contaminant Indicators - specific conductance, pH, total organic halogens, total organic carbon.
Metals: Cu, Cr, Pb, Zn, Cd, Ni, Ag
VOA: Volatile Organics
PP: Priority Pollutants
Cr^{+6}: Hexavalent Chromium
Cn: Cyanide
EDB: Ethylene Dibromide

(1) Includes methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), and xylenes.

Interim RI report [NUS, November, 1988]) potentially disposed of at Site 16, such as metals. The objective of the analysis was to select a broad range of constituents in order to detect potential contamination.

Contaminants were detected in all Round 1 samples; therefore, two additional (potential upgradient) wells were installed during Round 2 activities. Round 1- and Round 2-installed wells (16GW01-06) were sampled and analyzed during Round 2. Analysis was expanded to include: priority pollutants organics and metals, methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), xylenes, hexavalent chromium, cyanide and ethylene dibromide (EDB). The list was expanded as contamination was detected during Round 1 and better definition of the chemical character of the groundwater was needed.

Contaminants were detected in all monitoring well samples analyzed during Round 2. Three additional wells were installed in an attempt to define the upgradient limits of the groundwater plume. These wells were located upgradient of the site, within or beyond a base industrial complex that may also be a source of groundwater contamination. Wells 16GW01-09 were sampled and analyzed for the same parameters as analyzed in Round 2.

Three surface water/sediment samples were collected from Slocum Creek and Sandy Branch, as located on Figure 3-4, and analyzed for the same constituents as the groundwater. These samples were collected as a preliminary assessment of water/sediment quality in these surface waters.

3.1.3.2 Analytical Results

The chemical analytical results for Site 16 are shown in Table 3-11. Data are included for Rounds 1, 2, and 3. Numerous compounds were found above laboratory detection limits.

3.1.4 Site 17 – Defense Reutilization and Marketing Office (DRMO)

3.1.4.1 Investigative Program

Sediment and soil samples were analyzed for PCBs, as summarized in Table 3-12. Six surface sediment samples (along ditch) and three soil samples (along fence) were collected and analyzed for PCBs during Round 1. Three additional soil samples were collected and analyzed for PCBs in Round 2. Sample locations are shown on Figure 3-5. PCBs were detected in samples collected in both Rounds 1 and 2. PCBs were detected in soils and sediment. A more comprehensive sampling program was conducted in Round 3. Sixty-six soil samples were collected at the surface and 1 foot deep in the

TABLE 3-11

SITE 16
CHEMICAL ANALYTICAL DATA
MCAS, CHERRY POINT, NC

Sample Number:	16GW01			16GW02			16GW03			16GW04			16GW05		16GW06		16GW07	16GW08	16GW09
Site Number:	16			16			16			16			16		16		16	16	16
Sample Round:	1	2	3	1	2	3	1	2	3	1	2	3	2	3	2	3	3	3	3
Date Sampled:	01/11/85	10/21/85	03/2/87	01/11/85	10/21/85	03/2/87	01/11/85	10/21/85	03/2/87	01/11/85	10/21/85	03/2/87	10/21/85	03/2/87	10/21/85	03/2/87	03/2/87	03/12/87	03/02/87
Sample Type:	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Volatiles (ug/l)																			
Toluene (ug/l)															22				
1,1,2,2-Tetrachloroethane (ug/l)	340	99	96	12	18													29	
Tetrachloroethene (ug/l)	8			7	11	15												39	
Trichloroethene (ug/l)	150	39	59	72	83	100	97	140	56	410	620	550			850	900		15	
Trans-1,2-Dichloroethene (ug/l)	120	43	84	86	110	140	75	95	79	2,000	1,500	1,400			260	280		14	
Vinyl Chloride (ug/l)	19					14						140							
Chloroform (ug/l)													20		9				
Phenolics (mg/l)			0.03															0.02	
Diethyl Phthalate																			36
Metals																			
Cyanide (mg/l)			0.007			0.006			0.005								0.059		0.006
Zinc (mg/l)	0.02	0.03	0.02	0.02	0.02		0.01	0.02			0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.05	0.01
Arsenic (mg/l)									0.007			0.003							0.001
Silver (mg/l)																		0.03	0.03

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TABLE 3-11
SITE 16
CHEMICAL ANALYTICAL DATA
MCAS, CHERRY POINT, NC
PAGE TWO

Sample Number: / Site Number:	16GW01 16			16GW02 16			16GW03 16			16GW04 16			16GW05 16		16GW06 16		16GW07 16	16GW08 16	16GW09 16
Sample Round:	1	2	3	1	2	3	1	2	3	1	2	3	2	3	2	3	3	3	3
Date Sampled:	01/11/85	10/21/85	03/2/87	01/11/85	10/21/85	03/2/87	01/11/85	10/21/85	03/2/87	01/11/85	10/21/85	03/2/87	10/21/85	03/2/87	10/21/85	03/2/87	03/2/87	03/12/87	03/02/87
Sample Type:	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Geochemical Parameters																			
pH	6 62	6 38	5 09	6 90	6 19	5 81	6 75	6 10	5 71	6 76	6 70	6 56	6 27	5 24	6 37	6 41	5 11	5 31	5 69
Spec conductance (umhos/cm)				260	200	170	300		220	440	415	310	176	130	380	360	280	240	150
Temperature (°C)	270	165	220	18	18 9	17 4	18	265	19 5	18	17 8	19 3	21 0	18	19 7	18 2	16 0	17 6	18 8
TOC (mg/l)	18	20	19 3	59 4			41 8	18 8		39 4									
TOX (as Cl)	33 6			130			170			780									
OVA (ppm)	600			9			20			20									
Static Water Level (ft)	21 00	20 73		9 56	5 68	6 34	7 25	6 51	7 09	8 55	5 04	5 45	22 13	21 60	14 40	14 05	15 58	18 32	17 15
Sampling Water Level (ft)	21 16	24 74	20 39	9 17	6 79		7 58	9 04		9 00	8 17		25 25		15 53				
Total Depth (ft)		26 50	26 41*		25 52	26 17*		24 64	26 35*		26 40	26 11*	24 43	26 79*	26 66	25 47*	27 72*	29 72	27 06
HNU (ppm)					10						16								

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TABLE 3-11
SITE 16
CHEMICAL ANALYTICAL DATA
MCAS, CHERRY POINT, NC
PAGE THREE

Sample Number: Site Number:	16SW01 SW	16SW02 SW	16SW03 SW	16SD01 SD	16SD02 SD	16SD03 SD
Sample Round: Date Sampled: Sample Type:	3 03/2/87	3 03/2/87	3 03/02/87	3 03/2/87	3 03/2/87	3 03/02/87
Organics						
Trichloroethene (ug/l)			30			
1,2-Trans-Dichloroethene (ug/l)			62			
Inorganics						
Arsenic (mg/l)	0.002		0.002			
Cyanide (mg/l)	0.007		0.048			
Cadmium (mg/kg)					3.9	33
Chromium (mg/kg)				44	47	92
Copper (mg/kg)				27	41	24
Lead (mg/kg)				120	200	120
Nickel (mg/kg)				6	5	11
Zinc (mg/kg)	0.01		0.01	110	80	68
Silver (mg/kg)						2
pH	6.79	7.01	6.69			
Spec. Conductance	150	70	170			
Temperature (°C)	16.2	15.4	19.5			

GW: Groundwater
SW: Surface Water
SD: Sediment
* From top of PVC pipe

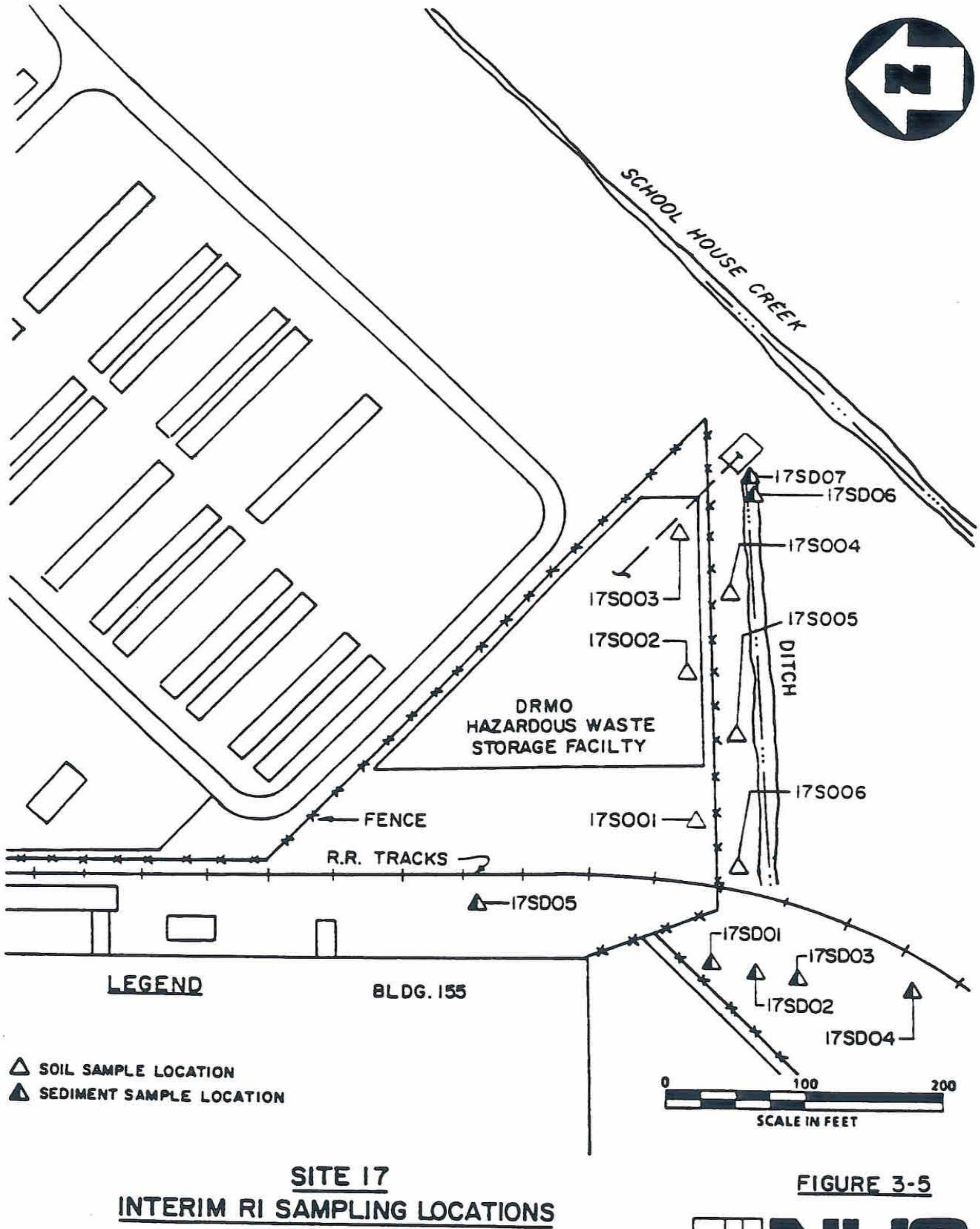
TABLE 3-12

SITE 17
SAMPLE COLLECTION AND DATA ANALYSIS
MCAS, CHERRY POINT, NORTH CAROLINA

Sample Type	PCB Analysis Sampling Round
SEDIMENT	
17SD01, 17SD02, 17SD03, 17SD04, 17SD05, 17SD06	1
SOIL	
17S001, 17S002, 17S003	1
17S004, 10S005, 17S006	2
17S0-1'-I-1 through -11	3
17S0-1'-O-1 through -11	3
17S0-0'-D-1 through -11	3
17S0-1'-D-1 through -11	3

Key: 1,2,3 = Sampling Round
PCB = Polychlorinated biphenyl

Note: See Table 3-14 (Samples 15SD09, 15SD10, 15SD11, and 15SD12).



SITE 17
INTERIM RI SAMPLING LOCATIONS
MCAS CHERRY POINT, NC

FIGURE 3-5

NUS CORPORATION

vicinity of the DRMO fence and 44 were analyzed for PCBs. Samples were taken along transects at every other post as shown in Figure 3-6. Sediment samples downgradient of the ditch were collected and analyzed for PCBs.

3.1.4.2 Analytical Results

A summary of the investigative results is presented in Tables 3-13 (Site 17) and 3-14 (downgradient sediments at Site 15).

Table 3-15 summarizes the results of sampling and analysis of soil/sediment at Site 17 conducted by MCAS, Cherry Point. Samples 1 through 9 were collected within the perimeter of the fence. Samples I-1 through I-10 were collected from the drainage ditch adjacent to the facility.

3.2 PRELIMINARY RISK ASSESSMENT

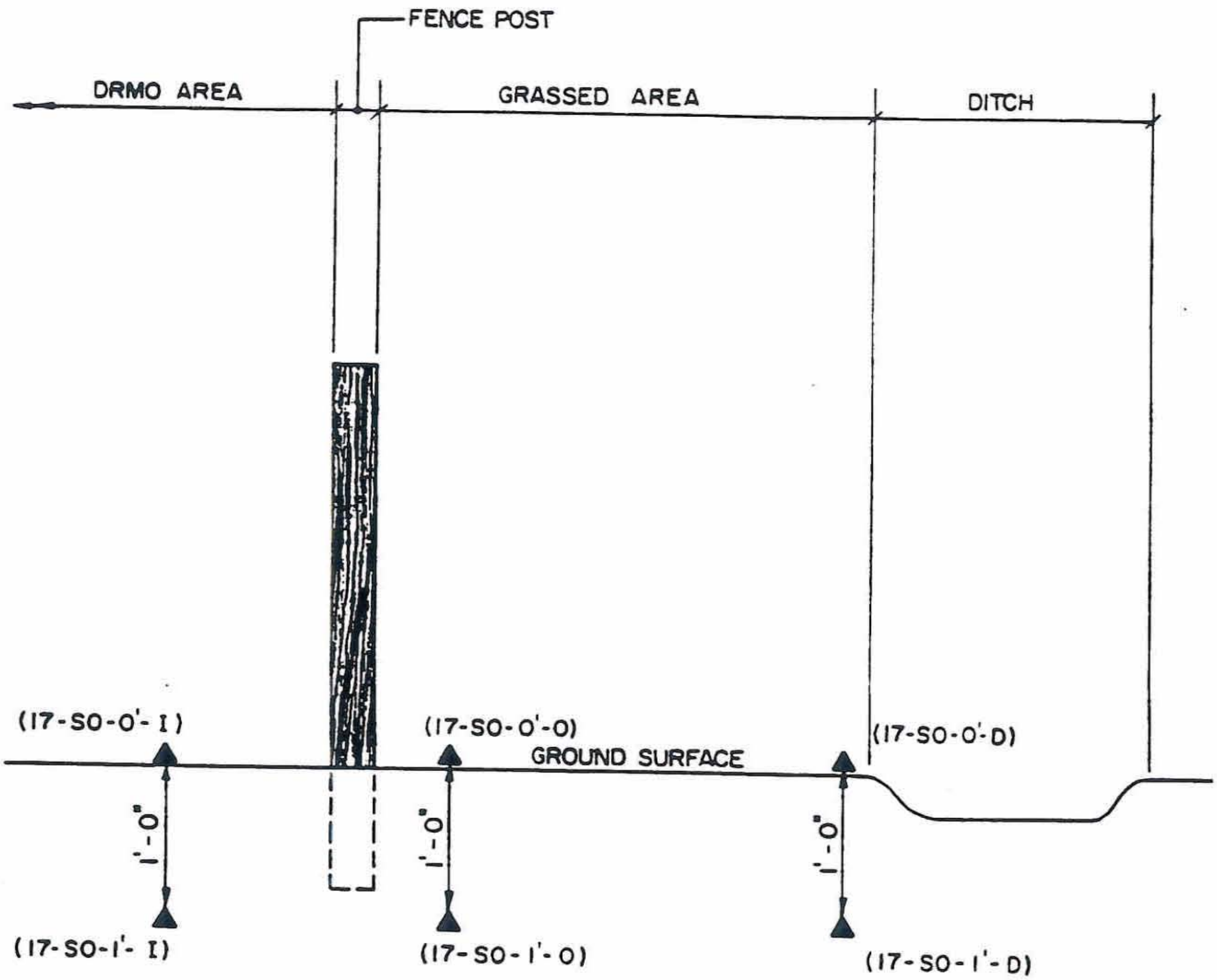
This section presents preliminary public and environmental health risk assessments of the contamination detected as a result of three rounds of sampling activities at MCAS, Cherry Point Sites 5, 10, 16, and 17. Factors considered in the risk assessment include the source(s) of contamination, the extent of the contamination detected, routes of contaminant transport, and the potential for human and environmental exposure. The main objective of the assessments is to characterize the public and environmental concerns based on the analytical data available to date and provide a basis for further investigations, if needed, at each site.

Contaminant levels detected in environmental media collected at each site of concern during previous site investigations are compared to the following Federal and state standards and criteria, when available:

- North Carolina State - Groundwater Quality Standards. North Carolina Administrative Code, Title 15, Subchapter 2L, 1985. Standards presented are for Class GA waters.

- North Carolina State - Surface Water Quality Standards. North Carolina Administrative Code, Title 15, Subchapter 2B, 1985. Standards presented are for Class SC surface waters.

- Maximum Contaminant Levels (MCLs) - MCLs are enforceable standards promulgated under the Federal Safe Drinking Water Act and are designed for the protection of human health. MCLs are based on laboratory or epidemiological studies and apply to drinking water supplies consumed by a minimum of 25 persons. They are designed for prevention



▲ – SOIL SAMPLE LOCATION

(17-SO-0-I) SAMPLE LOCATION DESIGNATION, I: INSIDE FENCE, O: OUTSIDE FENCE, D: ADJACENT TO DITCH

SITE NO. 17
ROUND 3
SOIL SAMPLING CROSS SECTION
MCAS CHERRY POINT, NC
NOT TO SCALE

FIGURE 3-6

NUS CORPORATION

TABLE 3-13

SITE 17
SOIL AND SEDIMENT SAMPLES – CHEMICAL ANALYTICAL DATA
MCAS, CHERRY POINT, NORTH CAROLINA

	Sample Round	Sample Type	Date	PCBs (µg/g)	PCB Species
SEDIMENTS					
17SD01	1	SD	01/14/85	0.87	1260
17SD02	1	SD	01/14/85	0.22	1260
17SD03	1	SD	01/14/85	0.65	1254
17SD06	1	SD	01/14/85	1.1	1260
SOILS					
17SO01	1	SO	01/14/85	5.9	1260
17SO03	1	SO	01/14/85	1.7	1260
17SO04	2	SO	10/17/85	43	1254/1260
17SO06	2	SO	10/17/85	5.1	1260
17SO-1'-I-8	3	SO	03/05/87	1.3	1254
17SO-1'-I-11	3	SO	03/05/87	14	1254/1260
17SO-0'-D-1	3	SO	03/07/87	7.6	1260
17SO-0'-D-2	3	SO	03/07/87	18	1260
17SO-0'-D-3	3	SO	03/07/87	10	1260
17SO-0'-D-4	3	SO	03/07/87	8.7	1260
17SO-0'-D-5	3	SO	03/07/87	7.2	1260
17SO-0'-D-6	3	SO	03/07/87	12	1260
17SO-0'-D-7	3	SO	03/07/87	340	1254
17SO-0'-D-8	3	SO	03/07/87	130	1254/1260
17SO-0'-D-9	3	SO	03/07/87	37	1254/1260
17SO-0'-D-10	3	SO	03/07/87	26	1260
17SO-0'-D-11	3	SO	03/07/87	32	1254/1260
17SO-1'-D-3	3	SO	03/07/87	8.1	1260
17SO-1'-D-4	3	SO	03/07/87	1.3	1260
17SO-1'-D-10	3	SO	03/07/87	1.9	1254/1260
17SO-1'-D-11	3	SO	03/07/87	23	1254/1260

SD Sediment
SO Soil

0' Sample collected at surface
1' Sample collected 1 foot deep
1,2,3 Sampling round

TABLE 3-14

SITE 17
DOWNGRADIENT SEDIMENTS (SITE 15)
MCAS, CHERRY POINT, NORTH CAROLINA

SAMPLE COLLECTION AND ANALYSIS

	GWCI	Phenolics	Metals	VOA	PCBs	VOA(1) PP	Cr + 6	CN	EP TOX
15SD09		3	3		3				3
15SD10		3	3		3				3
15SD11		3	3		3				3
15SD12		3	3		3				3

CHEMICAL ANALYTICAL DATA

Sample Number	15SD09	15SD010	15SD011	15SD012
Sample Round: Date Sampled: Sample Type:	3 02/20/87 SD	3 02/20/87 SD	3 02/20/87 SD	3 02/20/87 SD
Cadmium (mg/kg)	2.4	2.3	3.9	1.2
Chromium (mg/kg)	24	27	50	7
Copper (mg/kg)	8	10	8	6
Lead (mg/kg)	14	28	54	160
Nickel (mg/kg)			4	8
Zinc (mg/kg)	28	41	28	53
Silver (mg/kg)		1		
Phenolics (mg/kg)				
PCBs (mg/kg)			6.9	

VOA Volatile Organics
PP Priority Pollutants
CN Cyanide
EP TOX EP Toxicity Extraction Procedure
SD Sediment
1,2,3 Rounds 1, 2, 3
GWCI Groundwater Contaminant Indicators - pH, specific conductance, total organic carbon, total organic halogen.
Metals: Copper, chromium, lead, zinc, cadmium, nickel, silver.
(1) See Appendix A of the Interim RI Report (NUS, November 1988)

TABLE 3-15

SITE 17
PCB SOIL SAMPLE RESULTS
MCAS, CHERRY POINT, NORTH CAROLINA

Date Sampled	Sample Number	Concentration (ppm)
01-17-86	1	<0.5
01-17-86	2	10.0
01-17-86	3	5.8
01-17-86	4	<0.5
01-17-86	5	<0.5
01-17-86	6	0.86
01-17-86	7	46.0
01-17-86	8	26.0
01-17-86	9	<0.5
01-23-86	I-1	<1
01-23-86	I-2	<1
01-23-86	I-3	2
01-23-86	I-4	<1
01-23-86	I-5	<1
01-23-86	I-6	3
01-23-86	I-7	<1
01-23-86	I-8	<1
01-23-86	I-9	<1
01-23-86	I-10	<1

Source: MCAS, Cherry Point, Natural Resources and Environmental Affairs Division, 1986.

of human health effects associated with lifetime exposure (70-year lifetime) of an average adult (70 kg) consuming 2 liters of water per day, but also reflect the technical feasibility of removing the contaminant. These enforceable standards also reflect the fraction of the toxicant expected to be absorbed by the gastrointestinal tract.

Maximum Contaminant Level Goals (MCLGs) - MCLGs are specified as zero for carcinogenic substances, based on the assumption of nonthreshold toxicity, and do not consider the technical or economic feasibility of achieving these goals. MCLGs are nonenforceable guidelines based entirely on health effects. The MCLs have been set as close to the MCLGs as is considered technically and economically feasible.

Ambient Water Quality Criteria (AWQC) - AWQC are not enforceable regulatory guidelines and are of primary utility in assessing acute and chronic toxic effects in aquatic organisms. They may also be used for identifying human health risks. AWQCs consider acute and chronic effects in both freshwater and saltwater aquatic life, and adverse carcinogenic and noncarcinogenic health effects in humans from ingestion of both water (2 liters/day) and aquatic organisms (6.5 grams/day), and from ingestion of water alone (2 liters/day). The AWQCs for the protection of human health for carcinogenic substances are based on the EPA's specified incremental cancer risk range of one additional case of cancer in an exposed population of 10,000,000 to 100,000 persons (i.e., the 10^{-7} to 10^{-5} range) and are generally based on older toxicologic data.

Health Advisories (HAs) - HAs are guidelines developed by the EPA Office of Drinking Water for nonregulated contaminants in drinking water. These guidelines are designed to consider both acute and chronic toxic effects in children (assumed body weight of 10 kg) who consume 1 liter of water per day or in adults (assumed body weight of 70 kg) who consume 2 liters of water per day. Health Advisories are generally available for acute (1 day), subchronic (10 days), and chronic (long-term) exposure scenarios. These guidelines are designed to consider only threshold effects and, as such, are not used to set acceptable levels of known or probable human carcinogens.

Reference Dose (RfD) - The RfD is developed by EPA for chronic and/or subchronic human exposure to hazardous chemicals and is based solely on the noncarcinogenic effects of chemical substances. The RfD is usually expressed as dose (mg) per unit body weight (kg) per unit time (day). It is generally derived by dividing a no-observed-(adverse)-effect-level (NOAEL or NOEL) or a lowest observed-adverse-effect-level (LOAEL) by an appropriate "uncertainty factor." NOAELs, etc., are determined from laboratory or epidemiological toxicity studies. The uncertainty factor is based on the availability of toxicity data.

Thus, the RfD incorporates the surety of the evidence for chronic human health effects. Even if applicable human data exist, the RfD (as diminished by the uncertainty factor) still maintains a margin of safety so that chronic human health effects are not underestimated. Thus, the RfD is an acceptable guideline for evaluation of noncarcinogenic risk, although the associated uncertainties preclude its use for precise risk quantitation.

Carcinogenic Potency Factor (CPF) - CPFs are applicable for estimating the lifetime probability (assumed 70-year lifespan) of human receptors contracting cancer as a result of exposure to known or suspected carcinogens. This factor is generally reported by EPA in units of kg-day/mg and is derived through an assumed low-dosage linear relationship and an extrapolation from high to low dose-responses determined from animal studies. The value used in reporting the slope factor is the upper 95 percent confidence limit.

Section 3.2.1 presents a discussion of the contaminant migration pathways common to all four sites under consideration. Sections 3.2.2 through 3.2.5 present a preliminary risk characterization of each site and further discuss contaminant migration pathways important to each site. Section 3.2.6 discusses the aquatic and terrestrial flora and fauna potentially impacted via contamination at or migrating from sites of concern at Cherry Point.

3.2.1 Contaminant Migration Pathways

The major contaminant transport pathways with a potential for human or environmental exposure at MCAS, Cherry Point Sites 5, 10, 16, and 17 are discussed in the following paragraphs.

Contaminant leaching and migration may occur from source areas to the underlying groundwater upon infiltration of precipitation. The shallow Surficial/Yorktown aquifer is particularly vulnerable to this contaminant transport pathway. Once in this aquifer, contaminants can migrate with the shallow groundwater and discharge to surface water bodies such as Slocum Creek or Turkey Gut. Aliphatic chlorinated hydrocarbons (such as trichloroethene) and soluble metals migrate easily into and within the groundwater; whereas less soluble organics such as polychlorinated biphenyls (PCBs) are less easily transported from the soil into the local groundwater.

Contaminants migrating to the shallow Surficial/Yorktown aquifer may be transported to underlying aquifers, if the confining layers isolating the shallow aquifer from deeper aquifers are not continuous. Available hydrogeologic data indicate that the confining layers between the aquifers may not be continuous in the southern part of the MCAS. Contaminants may also migrate from the shallow aquifer to the deeper aquifer along the casings of abandoned wells, although this is highly unlikely as lower aquifers, particularly the Castle Hayne Aquifer, are under artesian, confined conditions.

The erosion of contaminated surface soils and the dissolution of surficial soil contaminants may transport contaminants to surface water bodies via surface water runoff. The existing MCAS drainage system directs surface water runoff to Slocum Creek via a system of ditches, storm sewers, and local tributaries.

Surface water bodies such as Slocum Creek may transport contaminants to the Neuse River. Additionally, contaminants are absorbed to and subsequently desorbed from creek sediments.

Wind erosion of contaminated surface soils, or vaporization of volatile organics, may transport contaminants. At sites where the source areas are relatively small or where source areas are capped or well-vegetated, this migration pathway is considered to be a minor component of contaminant transport.

3.2.2 Site 5 - Storage Tanks for Waste Petroleum, Oil, and Lubricant (POL)

3.2.2.1 Sources of Contamination

Site No. 5 includes two storage tanks (1129 and 1771) previously utilized to store No. 6 fuel oil (Tank 1129) and waste petroleum, oil, and lubricants (Tank 1771). Contaminated water in Tank 1771 was historically discharged via a drainage ditch to the adjacent Slocum Creek. Previous site investigations report obvious contamination of the site soils via petroleum products and/or wastes. Organic contamination of site soils and groundwater associated with the spillage of oil products and/or wastes is considered the primary source of contamination at the site.

Additional potential sources of contamination include:

- Buried transformers from dismantled Building 90 (the suspected area of contamination is located upgradient of Tank 1771 and also used for the short-term storage of PCB-contaminated soils).
- Transformers from the transformer station located within the site area.

In 1986, MCAS Cherry Point remediated some PCB-contaminated soils at Site 5 by the removal and offsite disposal of 200 cubic yards of contaminated soils.

3.2.2.2 Preliminary Risk Characterization

Groundwater

Analysis of groundwater samples collected from Site 5 monitoring wells reveals the presence of low-level chlorinated hydrocarbons in wells downgradient of Tank 1771. Table 3-16 compares the levels of trichloroethene (TCE) and other compounds detected in the site monitoring wells to current applicable and relevant Federal and North Carolina State standards and criteria. The highest level of organic contamination was detected in monitoring well 5GW07, which was the only downgradient well screened to collect samples at the surface of the shallow water aquifer. The trichloroethene level detected in this well exceeds the current Federal SDWA MCL. PCBs (Arochlor 1260) were also detected in 5GW07. Low levels of phenols, arsenic, copper, and zinc were detected in several of the monitoring wells; however, a clear upgradient/downgradient or source-associated contaminant pattern was not evident. The levels of arsenic, copper, and zinc may reflect natural groundwater levels. The concentration of phenols and inorganics detected do not contribute substantially to the potential public health risk associated with human exposure to groundwater contaminants detected at the site.

The groundwater contamination detected at Site 5 indicates the need for further investigation to determine the extent of contamination of the shallow water aquifer and to fully characterize public and environment health risks associated with the site. Although the shallow groundwater aquifer in the vicinity of Site 5 is not currently used as a domestic water supply source, human exposure to contaminants within the aquifer could occur as a result of contaminant migration from the shallow aquifer to the deep Castle Hayne aquifer (approximately 115 feet deep), which is used as a domestic water supply source for the MCAS and the City of Havelock. Additionally, human exposure could occur as a result of contaminated groundwater discharge to the surface waters of Slocum Creek. The former case is considered unlikely because the confining layers (20 to 70 feet) separating the shallow

TABLE 3-16

RFI UNIT 5: TOXICOLOGICAL EVALUATION (WATER)
MCAS, CHERRY POINT, NORTH CAROLINA

Compound	Concentration Range (No. of Positive Detection/ No. of Samples[a])		Standards and Criteria							
			North Carolina Water Quality Standards		MCLs[3][4][5]	MCLG[3][4][5]	Health Advisories[3] (µg/L)	AWQC[6][7][8]		RfD[9] (mg/kg/day)
	MW	SW	GW[1][b]	SW[2][d]				Drinking Water	Fish	
1,1 Dichloroethane	5-19 µg/L (4/20)	ND	(c)	NR	NR	NR	NR	NR	NR	1.0 x 10^{-1}
Trichloroethene	18 µg/L (1/20)	5 µg/L (1/2)	(c)	NR	5 µg/L[e]	0[e]	NR	0 (2.8 µg/L)[h]	80.7 µg/L	NR
Chloroform	8 µg/L (1/20)	ND	(c)	NR	100 µg/L[i]	NR	NR	0 (0.19 µg/L)[h]	1.24 mg/L	1.0 x 10^{-2}
Aroclor-1260[m]	1.1-35 µg/L (2/13)	ND	(c)	0.001 µg/L	0.5 µg/L[f]	0[f]	Longer term (child): 1 Longer term (adult): 4	0 (< 12.6 ng/L)[h]	0.079 µg/L	NR
Oil	1.2-31 mg/L (10/26)	4.2-5.1 mg/L (2/2)	(c)	*	NR	NR	NR	NR	NR	NR
Phenolics	0.02-0.06 mg/L (3/7)	ND	0.001 mg/L	*	NR	NR	NR	3.5 mg/L [l]	NR	6.0 x 10^{-1} [l]
Arsenic	1-14 µg/L (4/7)	1-2 µg/L (2/4)	50 µg/L	50 µg/L	50 µg/L [i][e]	50 µg/L [f]	NR	0 (25 ng/L)[h]	190 µg/L-chronic 360 µg/L-acute	1.0 x 10^{-3}
Copper	20-30 µg/L (3/7)	ND	(c)	0.01 mg/L	1.0 mg/L[j] 1.3 mg/L[f]	1.3 mg/L [f]	NR	1 mg/L Organoleptic	12 µg/L-chronic[o] 18 µg/L acute[o]	3.7 x 10^{-2}
Zinc	20-190 µg/L (3/7)	ND	(c)	0.05 mg/L	5 mg/L[j]	NR	NR	5 mg/L[n]	110 µg/L-chronic[o] 120 µg/L-acute[o]	2.0 x 10^{-1}
Cyanide	ND	0.005-0.011 mg/L (3/4)	(c)	0.005 mg/L	NR	NR	1-day (child): 200 10 day (child): 200 Longer term (child): 200 Longer term (adult): 800 Lifetime: 200	200 µg/L	5.2 µg/L-chronic 22 µg/L-acute	2.0 x 10^{-2}

AWQC Ambient Water Quality Criteria for ingestion of drinking water or fish
MCL Maximum Contaminant Level
MCLG Maximum Contaminant Level Goal
SW Surface Water
MW Monitoring Wells
ND Not detected in µg/g (ppm) or mg/kg (ppm)
ND Not detected above laboratory detection limits

NR Not Reported
RfD Reference Dose

Sources:
(1) North Carolina Administrative Code, Title 15, Subchapter 2L, 1985
(2) North Carolina Administrative Code, Title 15, Subchapter 2B, 1985
(3) U.S. EPA, 1989a
(4) U.S. EPA, May 22, 1989
(5) U.S. EPA, August 18, 1988
(6) U.S. EPA, 1980
(7) U.S. EPA, July 29, 1985
(8) U.S. EPA, 1986
(9) U.S. EPA, 1989b
(10) U.S. EPA, March 2, 1987

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TABLE 3-16
RFI UNIT 5: TOXICOLOGICAL EVALUATION (WATER)
MCAS, CHERRY POINT, NORTH CAROLINA
PAGE TWO

* Amounts that will not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses.

(a) Includes data from Round 1, Round 2 and Round 3 monitoring
(b) Standards tabulated are for Class GA waters. Any increase in the concentration of a constituent of 50 percent of a standard may result in a review or modification of an existing permit, requirements for additional monitoring, or issuance of a special order where a violation of standards may be predicted. Standards for Class GSA, Class GB, and Class GSB may also apply.
(c) For substances not specified, the standard is the naturally occurring concentrations as determined by the North Carolina Department of Natural Resources and Community Development Division of Environmental Management. Man-made or other substances that do not naturally occur are prohibited.
(d) Standards tabulated are for Class SC surface waters.
(e) Final
(f) Proposed
(h) The AWQC for known or suspected carcinogens is zero. Because zero may not be attainable, the values tabulated correspond to a 10^{-6} cancer risk (one additional case of cancer in one million people exposed).
(i) National Primary Drinking Water Standard MCL.
(j) Secondary Primary Drinking Water Standard MCL.
(l) Value for phenol.
(m) Values for total polychlorinated biphenyls.
(n) Organoleptic effects.
(o) Based on a calculated hardness of 100 mg/L.

aquifer from the deep water supply aquifer are contiguous for most of the MCAS, including Site 5. Receptor exposure to surface waters, recharged via the shallow groundwater, is the more likely potential scenario.

Surface Waters and Sediments

Trichloroethene, detected at one downgradient surface water sample location, was the only organic compound identified in the surface waters and sediments collected at Site 5. Concentrations of arsenic below the Federal SDWA MCL were also detected in the surface water samples. The concentrations of metals detected in Slocum Creek sediments at the sampling location immediately downgradient of the Site 5 drainage ditch were greater than the concentration detected in the sediment sampling locations immediately upgradient of the drainage ditch and also contained PCB contamination. Refer to Table 3-17, which compares levels of PCBs in sediment to Federal and North Carolina state standards and criteria. Cyanide was detected in three surface water sample locations, but was not found in any of the site monitoring well samples. The cyanide levels detected were below EPA Health Advisories and Ambient Water Quality Criteria. It is possible that other potential sources of cyanide may exist in the vicinity of Site 5.

The low-level organic and inorganic contamination detected in the surface water and sediments is evidence of possible contaminant migration from Site 5 via surface runoff or contaminated groundwater discharge to Slocum Creek. Individuals utilizing Slocum Creek for recreational purposes are the human receptors of concern. Exposure could occur as a result of the consumption of fish taken from Slocum Creek, dermal contact with contaminated sediments or surface waters, or the accidental ingestion of creek water during recreation (e.g., swimming, water skiing). Environmental receptors such as the following aquatic and terrestrial species inhabiting or relying on the waters of Slocum Creek are also potentially impacted via exposure to contaminated surface waters and sediments: striped bass, mallards, largemouth bass, wood ducks. Section 3.2.6 presents information on the aquatic and terrestrial wildlife and ecosystems at Cherry Point.

It should be noted that the North Carolina Department of Natural Resources and Community Development has classified Slocum Creek as SC estuarine waters; that is, suitable for fish and wildlife propagation and secondary recreation (i.e., usage not involving whole body contact).

Surface and Subsurface Soils

Insufficient data are presently available to estimate the public or environmental health risk associated with potentially contaminated soils at Site 5. Monitoring well boring logs from previous

TABLE 3-17

SITE 5
TOXICOLOGICAL EVALUATION (SEDIMENT)
MCAS, CHERRY POINT, NC

Compound	5SD01 Round 1 01/11/85 (ppm)	5SD03 Round 3 03/03/87 (ppm)	North Carolina PCB Soil Action Level (ppm)(1)	EPA Soil Action Levels (ppm)(2)	
				Accessible by Children(a)	Not Accessible by Children(b)
PCBs (total)	.00096		5	Acute-5	Acute-25
PCB-1260		26	5	Chronic-0.2	Chronic-0.2

PCBs Polychlorinated Biphenyls.
Results reported in µg/g (ppm) or mg/kg (ppm).
(a) Site is accessible to children with the possibility of ingestion of contaminated soil.
(b) Onsite exposure is of concern without soil ingestion. Contaminated soil is covered with at least 10 cm of cover material.

Sources: (1) North Carolina Department of Natural Resources and Community Development, 1986.
(2) Falco, 1985.

investigations show a zone of subsurface soil banded with petroleum product as deep as 5 feet, indicating that the soils may be contaminated to the water table. If contaminated, surface and subsurface soils would be potential sources of groundwater or surface water contamination at the site.

Surface soils in one area of the site have been historically sampled and found to be contaminated with PCBs. Some contaminated surface soils have been removed and these soils have been resampled, analyzed, and shown to be below the North Carolina PCB action level as shown in Table 3-18. If additional PCB contamination is identified as a result of the RI, additional health based criteria as well as estimates of human health and environmental risks will be utilized to evaluate any PCB contamination detected in Site 5 soils and sediments.

Available toxicity literature reports that PCBs are readily absorbed through the digestive tract and are toxic via ingestion. PCBs are classified as B-2 carcinogens (i.e., probable human carcinogen).

3.2.3 Site 10 – Old Sanitary Landfill

3.2.3.1 Sources of Contamination

Site 10, a 40-acre landfill located along Turkey Gut and Slocum Creek south of the base Sewage Treatment Plant, has served as the main disposal area for the base since 1955. Hazardous wastes and POL have been landspread, burned, and stored in unlined pits and/or buried at the site. Surface impoundments previously utilized as industrial waste pits exist in the northern portion of the landfill area (north of Turkey Gut). The majority of wastes stored within the impoundments have been excavated and the impoundments were clean filled. Obvious seepage (i.e., brown water with an oily appearance) was observed (March 1982) along the bank of Turkey Gut from the higher fill areas.

3.2.3.2 Preliminary Risk Characterization

Groundwater

Analysis of groundwater collected from site monitoring wells indicates the presence of organic and inorganic contamination. Table 3-19 compares the levels detected to current applicable and relevant Federal and state standards and criteria. The contaminants of concern are primarily volatile organic compounds. The benzene, trichloroethene (TCE), and vinyl chloride concentrations detected exceed current Federal Safe Drinking Water Act (SDWA) MCLs, indicating that the water is not suitable for human consumption. Benzene and vinyl chloride are classified as Class A (human) carcinogens.

TABLE 3-18

SITE 5
TOXICOLOGICAL EVALUATION
POST-CLEANUP SAMPLES
MCAS, CHERRY POINT, NC

Compound	Sample Number (1)									North Carolina PCB Soil Action Level (ppm)(2)	EPA PCB Soil Action Levels (ppm)(3)	
	H-1	H-2	H-3	H-4	H-5	H-6	H-7	H-8	H-9		Accessible by Children (a)	Not Accessible by Children(b)
PCBs	<1	<1	4	<1	<1	<1	<1	<1	<1	5	Acute - 5 Chronic - 0.2	Acute - 25 Chronic - 0.2

Notes: PCBs - Polychlorinated Biphenyls.
Results reported in µg/g (ppm) or mg/kg (ppm).
(a) - Site is accessible to children with the possibility of ingestion of contaminated soil.
(b) - Onsite exposure is of concern without soil ingestion. Contaminated soil is covered with at least 10 cm of cover material.

Sources: (1) - MCAS Cherry Point, Natural Resources and Environmental Affairs Division, 1985.
(2) - North Carolina, Department of Natural Resources and Community Development, 1986.
(3) - Falco, 1985.

groundwater from the shallow aquifer to the deeper aquifers is a possibility. Individuals utilizing a contaminated groundwater supply would potentially be exposed to the contaminants (such as TCE) via ingestion, dermal, and inhalation routes of exposure.

Surface Water/Sediments

Analysis of surface waters adjacent to Site 16 detected the presence of TCE, t-1,2-DCE, arsenic, cyanide, and zinc. The level of TCE detected exceeds the MCL. The levels of t-1,2-DCE and cyanide exceed the North Carolina Water Quality Standards but do not exceed the MCLG goal for t-1,2-DCE, the EPA Health Advisory, or Ambient Water Quality Criteria for cyanide. The levels of arsenic and zinc do not exceed state water quality standards. A potential source of the volatile organic contaminants is the discharge of contaminated groundwater from the site. Surface water runoff from the Site 16 landfill may also be contributing to the contamination noted in Sandy Branch and Slocum Creek. It should be noted that cyanide was also detected in site monitoring wells. Consequently, site groundwater contamination may be contributing to the surface water cyanide concentrations.

Volatile organics were not detected in the sediment samples collected from the surface water bodies adjoining the site. Although several metals (e.g., cadmium, chromium, copper, lead, nickel, zinc, and silver) were detected in sediment samples collected from sample locations adjoining the site, the levels detected do not differ substantially from those detected at the upgradient sample location.

Exposure to contaminants in surface water and sediments adjoining Site 16 may occur as the result of dermal exposure or accidental ingestion during recreation or indirectly, as the result of the consumption of contaminated biota. The public health risk associated with these exposures would be mitigated by the following factors:

- Public access to MCAS, Cherry Point is restricted.
- The surface waters adjoining Site 16 are not classified for recreational activities that involve whole body contact with the surface waters (i.e., swimming).

Surface/Subsurface Soils and Wastes

Soil samples were not collected during the three sampling rounds conducted at Site 16. Surface and subsurface soil contamination have not been investigated. Waste materials buried at the site may present a potential hazard to receptors such as MCAS personnel or site remediation workers if the waste materials become exposed, the surface soils are contaminated, or leachate seeps develop.

Exposure may occur as a result of dermal contact with contaminated soils or leachates or the inhalation of contaminated soil particulates.

3.2.5 Site 17 - Defense Reutilization and Marketing Office (DRMO)

3.2.5.1 Sources of Contamination

Site 17 is a 1-acre area and associated drainage ditch. The area is utilized for storage, including transformers containing PCBs. The soils of the drainage ditch were reportedly contaminated with PCBs as a result of spills occurring from 1961 to 1968 and as a result of the alleged drainage of transformers into the drainage ditch.

3.2.5.2 Preliminary Risk Characterization

Soils and Sediments

Analysis of soils and sediments in the drainage ditch adjacent to the Defense Reutilization and Marketing Office (DRMO) storage area has detected the presence of PCBs. The PCB contamination of soils extends at least 1 foot below the surface soils. Table 3-22 summarizes PCB levels found in the soils and sediments collected during 3 rounds of sampling, and compares the concentrations detected in soil and sediment samples to North Carolina state and EPA PCB soil "action levels" (Falco, 1985). During preparation of the final risk assessment for this project, additional health-based criteria and estimates of human health and environmental risks will be utilized to evaluate any PCB contamination detected in Site 17 soils and sediments.

PCBs were detected in at least fifty (50) percent of the samples collected.

Available toxicity literature reports that PCBs are readily absorbed through the digestive tract and are toxic via ingestion. PCBs have tested positive in mutagenic assays and are classified as B-2 carcinogens (i.e., probable human carcinogens).

The Site 17 PCB contamination described in preceding paragraphs indicates the need for further investigation to determine the potential for adverse effects on human or environmental receptors. The contamination detected exceeds levels considered acceptable by Federal and state authorities.

TABLE 3-22

SITE 17
TOXICOLOGICAL EVALUATION
MCAS, CHERRY POINT, NC

	PCBs	North Carolina PCB Soil Action Level (ppm)[1]	EPA PCB Soil Action Levels (ppm)[2]	
			Accessible by Children[d]	Not Accessible by Children[e]
SEDIMENT				
17SD01	0.87[a]	5	Acute-5 Chronic-0.2	Acute-25 Chronic-0.2
17SD02	0.22[a]	5		
17SD03	0.65[c]	5		
17SD06	1.1[a]	5		
SOILS				
17SO01	5.9	5		
17S0002	1.7	5		
17SO03	43	5		
17SO04	5.1	5		
17SO-1'-1-8	1.3[c]	5		
17SO-1'-1-11	14[b]	5		
17SO-0'D-1	7.6[a]	5		
17SO-0'D-2	18[a]	5		
17SO-1'-1-8	1.3[c]	5		
17SO-1'-1-11	14[b]	5		
17SO-0'D-1	7.6[a]	5		
17SO-0'D-2	18[a]	5		
17SO-0'D-3	10[a]	5		
17SO-0'D-4	8.7[a]	5		
17SO-0'D-5	7.2[a]	5		

TABLE 3-22
SITE 17
TOXICOLOGICAL EVALUATION
MCAS, CHERRY POINT, NC
PAGE TWO

	PCBs	North Carolina PCB Soil Action Level (ppm)[1]	EPA PCB Soil Action Levels (ppm)[2]	
			Accessible by Children[d]	Not Accessible by Children[e]
SOILS – CONTINUED				
17SO-0'D-6	12[a]	5		
17SO-0'D-7	340[c]	5		
17SO-0'D-8	130[b]	5		
17SO-0'D-9	37[b]	5		
17SO-0'D-10	26[a]	5		
17SO-0'D-11	32[b]	5		
17SO-1'-D-3	8.1[a]	5		
17SO-1'-D-4	1.3[a]	5		
17SO-1'-D-10	1.9[b]	5		
17SO-1'-D-11	23[b]	5		

Results reported in ug/g or mg/kg (ppm).
PCBs: Polychlorinated biphenyls.

a PCB-1260
b PCB-1254/1260
c PCB-1254
d Site is accessible to children with the possibility of ingestion of contaminated soil.
e Onsite exposure is of concern without soil ingestion. Contaminated soil is covered with at least 10 cm of cover material.

Sources:
1 North Carolina Department of Natural Resources and Community Development, 1986.
2 Falco, 1985.

Surface Waters/Groundwaters

Insufficient data are presently available to estimate the public or environmental health risk associated with human exposure to potentially contaminated surface waters or groundwaters at Site 17. Groundwater and surface water samples were not collected during previous site investigations. The PCB-contaminated soils described in the preceding paragraph are a source area for the potential contamination of surface waters and sediments in the adjoining streams and may contaminate underlying groundwaters.

Human exposure could occur as a result of dermal contact or accidental ingestion of surface waters contaminated with PCBs migrating from the site via surface water runoff or the discharge of potentially contaminated groundwater to the surface waters adjoining the creek. Exposure may also result from the ingestion of contaminated biota. The bioconcentration factor for PCBs is 100,000 (Lappenbusch, 1980), which indicates a potential to bioconcentrate in the tissues of exposed receptors. Additionally, human exposure could occur if aquifers (shallow and deep) underlying Site 17 are contaminated. This scenario is unlikely because the shallow aquifer is not used as a drinking water supply source. Also, the deep water supply aquifer in the vicinity of Site 17 is isolated from the shallow aquifer by confining layers limiting the downward migration of contaminants.

3.2.6 Environmental Receptors at Cherry Point

Terrestial and aquatic ecosystems at Cherry Point support a varied wildlife community. Forested, wetland, and aquatic ecosystems are found on and in the areas bordering the MCAS.

Hardwood and pine forests are found in the upland areas of the MCAS; Water oak, willow oak, black gum, tupelo gum, cypress, red maple, white bay, ash, and pine species predominate. The forests provide habitat for many wildlife species: wood warblers, woodcocks, owls, hawks, deer, raccoons, oppossums, woodpeckers, and pinewarblers.

A unique ecosystem within the Croatan National Forest abutting MCAS, Cherry Point is the pocosins, which is a freshwater wetland characterized by slow runoff coupled with poorly drained soils. The pond pine predominates in this ecosystem, which provides habitat for the pine barrens treefrog, the spotted turtle, white tailed deer and the black bear.

Three ponds and the Slocum and Hancock Creeks support wetland communities at MCAS, Cherry Point. The ponds at MCAS also provide habitat for finfish and water fowl (mallards, black ducks). The Slocum and Hancock Creeks and the Neuse River shelter a variety of freshwater and estaurine species.

The following species considered unique, threatened, and/or endangered by the U.S. Fish and Wildlife service have been sighted or are thought to be present at Cherry Point:

- American alligator
- Eastern bluebird
- Cooper's hawk
- Red shouldered hawk
- Turkey Vulture
- Red-head woodpecker
- Osprey

3.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

One of the primary concerns in the development of remedial action alternatives for sites governed by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is the degree of public health or environmental protection afforded by each remedy. EPA policy states that in the process of developing and selecting remedial action alternatives, primary consideration should be given to actions that attain or exceed Applicable or Relevant and Appropriate Requirements (ARARs), as defined by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and the Superfund Amendments and Reauthorization Act (SARA). The purpose of this requirement is to make CERCLA response actions consistent with other pertinent Federal and state environmental requirements.

SARA defines an ARAR as

- Any standard, requirement, criterion, or limitation under Federal environmental law.
- Any promulgated standard, requirement, criterion, or limitation under a state environmental or facility siting law that is more stringent than the associated Federal standard, requirement, criteria, or limitation.

Applicable requirements are Federal public health and environmental requirements that would be legally applicable to a remedial action if that action was not undertaken pursuant to CERCLA. For example, if hazardous waste activities were undertaken pursuant to an approved permit, applicable regulations would be available to legally define the required remedial action for site closure. Relevant and appropriate requirements are Federal public health and environmental requirements that apply to circumstances sufficiently similar to those encountered at CERCLA sites, where their application would be appropriate, although not legally required. In addition, SARA now requires that state ARARs be considered during the assembly of remedial alternatives, if they are more stringent than Federal requirements. EPA has also indicated that "other" criteria, advisories, and guidelines must be considered in devising remedial alternatives. Examples of such "other" criteria include EPA Drinking Water Health Advisories, Carcinogenic Potency Factors (CPFs), and Reference Doses (RfDs).

Section 121 of SARA requires that the remedy for a CERCLA site must attain all ARARs unless one of the following conditions is satisfied: (1) the remedial action is an interim measure where the final remedy will attain the ARAR upon completion; (2) compliance will result in greater risk to human health and the environment than other options; (3) compliance is technically impracticable; (4) an alternative remedial action will attain the equivalent of the ARAR; (5) for state requirements, the state has not consistently applied the requirement in similar circumstances, or (6) compliance with the ARAR will not provide a balance between protecting public health, welfare, and the environment at the facility with the availability of Fund money for response at other facilities (i.e., Fund-balancing).

In addition to governing response actions at a site, ARARs may also dictate other aspects of the remedial investigation/feasibility study. For example, standard analytical methods may be inadequate to indicate compliance or exceedance of the ARAR. Therefore, it is often necessary that ARARs be considered during the specification of chemical-analytical methods. In light of such concerns, ARARs will be considered at four points during the RI/FS process: (1) Scoping of the Field Investigation (Task 1); (2) Risk Assessment (Task 6); (3) Remedial Alternatives Screening (Task 9); and (4) Remedial Alternatives Evaluation (Task 10).

ARARs fall into three broad categories, based on the manner in which they are applied at a site. These categories are as follows:

- Contaminant-Specific - These ARARs govern the extent of site cleanup. Such ARARs may be actual concentration-based cleanup levels or they may provide the basis for calculating such levels.

- Location-Specific - These ARARs are considered in view of natural or man-made site features. Examples of natural site features include wetlands, scenic rivers, and floodplains. Man-made features could include, for example, the presence of historic or archaeologic districts. ARARs based on aquifer designations are also location-specific ARARs.

- Action-Specific - These ARARs pertain to the implementation of a given remedy. Examples of action-specific ARARs include monitoring requirements, effluent discharge limitations, hazardous waste manifesting requirements, and occupational health and safety requirements.

Tables 3-16 through 3-22 present a preliminary listing of concentration-based ARARs for chemicals detected during Rounds 1, 2, and 3 of the interim Remedial Investigation.

Tables 3-23 and 3-24 present a summary of preliminary Federal and state ARARs for Sites 5, 10, 16, and 17. The rationale for the inclusion of each ARAR is provided in the tables. The ARARs identified in Tables 3-23 and 3-24 will be refined and revised, as necessary, as the RI/FS proceeds.

3.4 PRELIMINARY SCOPING OF REMEDIAL TECHNOLOGIES

The project goal for the four sites of concern is to identify and evaluate remedial alternatives to reduce present and potential public health and environmental exposure routes and contaminant pathways to acceptable levels. To accomplish this goal, the problems associated with the site (e.g., contaminated surface and subsurface soils, contaminated surface water and sediments, and potential groundwater contamination) must be addressed. Preliminary remedial technologies for each site problem have been identified and are summarized in Table 3-25. Source control technologies include the following: treatment that eliminates or reduces the need for long-term management at the site, containment, and no action.

The screening of technologies (Task 9) and the identification of innovative technologies will begin shortly after approval of the project plans. Treatability studies as well as bench-scale and pilot

TABLE 3-23

FEDERAL PRELIMINARY ARARs AND TBCs[1]
MCAS, CHERRY POINT, NC

Contaminant-Specific	
Requirement	Rationale
Hazardous Waste Requirements (RCRA Subtitle C, 40 CFR, Part 264)	Standards applicable to treating, storing, and disposing of hazardous waste.
Safe Drinking Water Act	
- Maximum Contaminant Levels (MCLs)	Remedial actions may provide groundwater cleanup to the MCLs.
- Maximum Contaminant Level Goals (MCLGs)*	SARA Section 121 (D) (2) (A) (II).
Toxic Substances Control Act (15 U.S.C. 2601)	
- TSCA health data, chemical advisories, and Compliance Program policy*	Considered in the public health evaluation.
Health Advisories, EPA Office of Drinking Water*	RI activities identified presence of chemical for which health advisories are listed.
Clean Water Act (PL92-500)	
- Federal Ambient Water Quality Criteria (AWQC): human health through ingestion of water*	Remedial actions may provide groundwater remediation to relevant AWQC.
Reference Doses (RfDs), EPA Office of Research and Development*	Considered in the public health evaluation.
Carcinogenic Potency Factors, EPA Environmental Criteria and Assessment Office; EPA Carcinogen Assessment Group*	Considered in the public health evaluation.
Clean Air Act (42 USC 7401)	
- National Ambient Air Quality Standards (NAAQS) for six criteria pollutants (40 CFR Part 50)	Remedial alternatives may include incineration or groundwater air-stripping technologies.
- Public health basis to list pollutants as hazardous under Section 112 of the Clean Air Act*	Remedial alternatives may include incineration or groundwater air-stripping technologies.
Health Effects Assessments*	Considered in the public health risk assessment included in RI Report.

TABLE 3-23
FEDERAL PRELIMINARY ARARs AND TBCs[1]
MCAS, CHERRY POINT, NC
PAGE TWO

Location-Specific	
Requirement	Rationale
EPA's Groundwater Protection Strategy*	Remedial alternatives must consider EPA classification of groundwater at site.
Endangered Species Act of 1978 (16 USC 1531)	Considered in the public health and environmental assessment.
Fish and Wildlife Coordination Act (16 USC 661)	Considered in evaluation of remedial alternatives.
Fish and Wildlife Improvement Act of 1978 (16 USC 742)	Considered in evaluation of remedial alternatives.
Fish and Wildlife Conservation Act of 1980 (16 USC 2901)	Considered in evaluation of remedial alternatives.
Executive Order 11988 (Floodplain Management)	Floodplain resources may be affected by site remedial alternatives.
Rivers and Harbors Act of 1899 (33 CFR Parts 320-327)	Remedial alternatives may affect the Slocum Creek and its tributaries.
Regulation of Activities Affecting Waters of the U.S. (33 CFR, Parts 320-329)	Corps of Engineers regulations apply to navigable waters.

TABLE 3-23
FEDERAL PRELIMINARY ARARs AND TBCs[1]
MCAS, CHERRY POINT, NC
PAGE THREE

Action-Specific	
Requirement	Rationale
Safe Drinking Water Act	
- Underground Injection Control Regulations (40 CFR, Parts 144, 145, 146, and 147)	May be applicable to onsite groundwater recirculation systems and tracer studies.
Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites, EPA Office of Emergency and Remedial Response*	Appropriate guidance for aquifer restoration.
Clean Water Act	
- NPDES Permit Requirements	Remedial alternatives may include discharge to surface waters.
- Federal Ambient Water Quality Criteria (AWQC) - freshwater aquatic life*	Remedial alternatives may include discharge to surface waters.
Threshold Limit Values, American Conference of Governmental Industrial Hygienists*	May be appropriate requirements for air concentrations during remedial activities.
Interim Guidance on Superfund Selection of Remedy, EPA Office of Solid Waste and Emergency Response*	Guidance for feasibility study.
Occupational Safety and Health Administration Requirements (29 CFR, Parts 1910, 1926, and 1904)	Required for workers engaged in onsite remedial activities.
Department of Transportation Rules for Hazardous Materials Transport (49 CFR, Parts 107, 171.1-171.500)	Remedial alternatives include offsite treatment and disposal.
Hazardous Waste Requirements (RCRA Subtitle C, (40 CFR Part 264))	Applicable to treating, storing, and disposing of hazardous wastes.

1. **ARAR: Applicable or Relevant and Appropriate Requirement.**
   TBC: Other Criterion, Advisory, or Guideline to be considered.

* = TBC

TABLE 3-24

NORTH CAROLINA STATE PRELIMINARY ARARs
MCAS, CHERRY POINT, NC

Contaminant-Specific	
Requirement	Rationale
North Carolina Oil Pollution and Hazardous Substances Control Act General Statutes of North Carolina, Chapter 143, State Department, Institutes and Commissions, Article 21A.	Remedial actions may include discharge upon land.
North Carolina Water Quality Standards, North Carolina Administrative Code, Title 15, Chapter 2, Subchapter 2B.	Remedial actions may require discharge to surface waters.
North Carolina Water and Resources Act, General Statutes of North Carolina, Chapter 143, State Department, Institutions and Commissions. Article 21 - Water and Air Resources.	Clarification of permits, air-cleaning devices, monitoring, effluent standards and limitations for possible discharge during remedial action.
North Carolina Air Pollution Regulations, North Carolina Administrative Code, Title 15 Department of Natural Resources and Community Development, Chapter 2, Subchapter 2D, 2H.	Incineration may be considered a potential remedial action.

Location-Specific	
Requirement	Rationale
North Carolina Coastal Area Management Act, General Statutes of North Carolina, Chapter 113A, Article 7.	Considered in areas of environmental concern and land use.

Action-Specific	
Requirement	Rationale
North Carolina Solid and Hazardous Waste Management Act. General Statutes of North Carolina Chapter 130A, Public Health, Article 9.	Applicable to hazardous wastes.
North Carolina Solid Waste Management Regulations North Carolina Administrative Code, Title 10, Chapter 106.	Acceptable disposal methods. Monitoring requirements for ground and surface water.

TABLE 3-25

POTENTIAL CONTROL AND REMEDIATION TECHNOLOGIES
MCAS, CHERRY POINT, NC

Technology	Advantages	Disadvantages	Media	Sites For Potential Use			
				Site 5	Site 10	Site 16	Site 17
EXCAVATION/DISPOSAL/NO ACTION							
No action	• Inexpensive	• Does not reduce mobility, toxicity, or volume of the wastes.	• Groundwater • Leachate • Soils	X	X	X	X
Transport to offsite landfill	• Allows for clean closure of site. • No long-term risk. • No maintenance.	• Expensive. • Not a permanent remedy.	• Soils	X	(X)	(X)	X
Onsite landfill	• Applicable for complex waste mixtures which otherwise cannot be economically treated or contained.	• Maintenance required. • Not recommended for areas located within the 100-year flood plain (Site 5 and Site 16).	• Soils	(X)	X	(X)	X
CONTROL TECHNOLOGIES							
Surface sealing or capping	• Not difficult or time-consuming to implement. • Reduces infiltration (a multilayer cap or seal eliminates infiltration).	• Does not eliminate infiltration. • Requires land use restrictions. • Not a permanent remedy. • Not recommended for areas located within the 100-year flood plain (Site 5 and Site 16). • Long-term maintenance required. • (A multilayer cap is more costly).	• Surface water • Groundwater • Soils	(X)	X	(X)	X
Groundwater pumping for plume containment	• Can use wells to control contaminant migration. • Proven technology	• Generates a large volume of contaminated water requiring treatment prior to discharge.	• Groundwater • Leachate		X	X	
Containment barrier	• Reduces migration of shallow, localized subsurface contaminants	• If contaminant dispersal is widespread and at considerable depth, barrier cannot be established.	• Oily layer of groundwater • Leachate	X	(X)		X
Grading and revegetation	• Stabilizes soil against erosion, reduces runoff, improves appearance	• Does not eliminate infiltration. • Not feasible for areas with high concentrations of phytotoxic chemicals.	• Soil	(X)	X	(X)	X

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TABLE 3-25
POTENTIAL CONTROL AND REMEDIATION TECHNOLOGIES
MCAS, CHERRY POINT, NC
PAGE TWO

Technology	Advantages	Disadvantages	Media	Sites For Potential Use			
				Site 5	Site 10	Site 16	Site 17
PUMP AND TREAT TECHNOLOGIES							
Carbon adsorption	• Proven and effective technology. • Applicable to a wide variety of organics. • Most effective for organics of low solubility and polarity.	• Relatively high capital and operating cost. • Requires disposal as a hazardous waste or thermal reactivation. • Inability to remove highly soluble and/or low molecular weight organics.	• Groundwater • Leachate • Air	X(2)	X	X	
Air stripping	• All volatile contaminants can be removed. • Effective and proven technology.	• Non-volatile organics are not removed. • Releases contaminants to the air.	• Groundwater • Leachate	X(2)	X	X	
Steam stripping	• Good for soluble, moderately volatile organics.	• Moderately expensive. • Requires disposal of concentrated waste stream.	• Groundwater • Leachate	X(2)	X	X	
Ozone/UV (or other oxidation process)	• Transforms some chlorinated organics to non-hazardous forms. • Well developed for cyanides, phenols and some organics.	• Oxidation reactions may not go to completion. • May require excess oxidizing agents.	• Groundwater • Leachate		X	X	
Biological treatment	• Good for most organics. • Destroys contaminants.	• Not effective for highly refractory compounds, metals, or cyanide. • May be inhibited by toxic metals.	• Groundwater • Leachate		X	(X)	
Incineration	• Proven and effective technology for organic liquid wastes. • Destroys contaminants.	• Heat content of liquid waste must be adequate.	• Oily layer of groundwater	X(1)			X(1)
Ion exchange	• Effective for metals removal.	• Volatile organics are not removed. • Selectivity/competition possible for metals. • Cyanide deteriorates resins.	• Groundwater • Leachate		(X)	(X)	

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TABLE 3-25
POTENTIAL CONTROL AND REMEDIATION TECHNOLOGIES
MCAS, CHERRY POINT, NC
PAGE THREE

Technology	Advantages	Disadvantages	Media	Sites For Potential Use			
				Site 5	Site 10	Site 16	Site 17
SOIL REMEDIATION TECHNOLOGIES							
Biodegradation	• Permanent treatment. • Relatively inexpensive and low hazard.	• Effectiveness and reliability not well demonstrated. • Some organics are resistant to biodegradation.	• Soil	(X)			(X)
Solidification	• Reduces mobility and leachability of contaminants. • Can dispose of immobilized waste on site. • Potentially a permanent remedy.	• Long-term effectiveness and reliability not well demonstrated. • Requires complete mixing. • Organics may still leach. • Weathering may reduce stability. • Probably requires landfill disposal with cover thick enough to keep waste below frost line. • Not recommended for areas located within the 100-year floodplain (Site 5 and Site 16) • Volume of waste to be disposed usually increases with this process.	• Soil	(X)	(X)	(X)	(X)
Soil Washing	• Reduces the volume of contamination through separation processes. • Potentially a permanent remedy.	• Effectiveness and reliability not well-demonstrated. • Requires disposal of concentrated waste.	• Soil	X			X
Incineration	• Completely destroys organics	• Incinerator ash must be disposed of in a proper manner. • Not applicable for metals. • Excavation of soils required	• Soil	X	(X)	(X)	X

X Applicable for a given site.
(X) Potentially applicable for a given site or site hot spots.
(1) Potential floating oil layer at the top of the groundwater table.
(2) Groundwater below the floating oil layer

testing will be identified as a result of the source control technologies evaluation conducted under Task 9.

3.5 DATA LIMITATIONS AND REQUIREMENTS

The previous sections of this Work Plan discussed the site in relation to the public health and environmental risks, ARARs, and potential remedial alternatives. The limitations of the existing data to complete the risk assessment and evaluate the potential alternatives are as follows:

Site 5 - The data are not sufficient to define the extent of contamination, calculate risk to receptors, or select potential remedial alternatives. In addition, the source is unknown. Although it is likely that the source was leaked material from Tank 1771 and the associated oil/water separator, buried alleged transformers from Building 90 or waste material in the vicinity of the former transformer station may be contributing to the contamination.

Existing data indicate that shallow groundwater is contaminated with PCBs, floating in an oil layer at the surface of the groundwater table. However, only one shallow well with a screen intersecting this zone was installed in previous investigations.

Site 10 - Existing data have concentrated on the RCRA impoundment and the north side of the landfill (north of Turkey Gut). There is insufficient information to define the nature and extent of contamination, to calculate risk, or to select potential remedial alternatives. Also, additional alleged disposal pits (the exact location(s) unknown) on the south side of the landfill may be a potential point source.

Information is also lacking on whether the underlying confining layers are continuous.

Site 16 - The data are not sufficient to define the source and extent of contamination. Therefore, risks to receptors cannot be calculated or potential remedial alternatives selected. Previous investigations focused on the landfill. However, results from these investigations indicate that an upgradient source, possibly the MCAS operations buildings or maintenance building, is contributing to the contamination. Another possibility may be that the landfill is larger than originally anticipated.

Drums of potassium cyanide may be present in the landfill, although quantities and locations are unknown.

Also, information is lacking on whether the underlying confining layers are continuous.

Site 17 - Existing data have concentrated on soils by the DRMO fence and the nearby drainage ditch. A few downstream sediments indicate that PCBs from Site 17 may have migrated offsite. No groundwater testing was conducted. The extent of contamination has not been clearly defined in previous investigations and so risks to receptors cannot be calculated or potential remedial alternatives selected. It is possible that PCBs have migrated, via the transformer oil, to the shallow groundwater, as appears to be the case at Site 5.

Data needed to supplement the existing limited data base and to further evaluate risks and remedial alternatives are presented in Table 3-26. The specific objectives of the RI/FS are also presented in Table 3-26, corresponding to the data requirements for each of the four sites for which investigations are proposed. These objectives, specific to each site, are developed to address the risks to the public health and environment, meet the ARARs, and evaluate appropriate remedial alternatives. The proposed investigation is intended to provide basic data on the existence and extent of potential contamination. The data collected may resolve many existing questions, but it may also leave some questions unanswered. If additional data are deemed necessary after the investigation, further analyses such as bioassays, bioavailability of contaminants and obtaining additional physical/chemical data may be necessary. This additional work is not included in the scope or schedule of this Work Plan.

3.6 DATA QUALITY OBJECTIVES (DQOs)

Data quality objectives (DQOs) are requirements needed to support decisions relative to the various stages of remedial action. The development of DQOs focuses on identifying the end use of the data to be collected, and determining the degree of certainty--with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC)--necessary to satisfy the intended end use of the data. Once the acceptable degree of certainty regarding the analytical results is determined, one of the following three analytical options is selected to describe the approach taken to achieve the desired goal.

- Level D - Laboratory Analysis Requiring Contract Laboratory Program (CLP) Analysis
  Used to investigate sites that are on or about to be included on the National Priority List (NPL). These sites are likely to undergo litigation. Characterized by rigorous quality assurance/quality control (QA/QC) protocols and documentation.

TABLE 3-26

SUMMARY OF RI/FS REQUIREMENTS
MCAS, CHERRY POINT, NC

Identified Contamination	Objective	Additional Data Required to Estimate Risks and Potential Remedial Alternatives	
		Risk	Engineering
SITE 5			
Soils: • PCBs and chlorinated volatile organics **Groundwater:** • Chlorinated volatile organics, oil and grease **Sediments:** • PCBs **Surface Water:** • Trichloroethene, cyanide, and oil and grease	Determine the source of contamination. Source may be Tank 1771, buried transformers from dismantled Building 90, or the transformer station; or a combination.	• NA	• Results from soil boring analysis for PCBs, volatiles, and TOC in drainage swale and around Tank 1771 • Results from soil boring analysis of transformer station and Building 90 soils. Most samples to be analyzed for PCBs, volatiles, cyanide, and TOC. A few samples to be analyzed for Target Compound List • Results from soil boring analysis of soils for volatiles and PCBs, based on elevated soil gas readings
	Ensure that the existing site features are adequately surveyed so that new soil and sediment samples can be properly located.	• NA	• Results from survey of Tank 1771, Tank 1129, dismantled Building 90, transformer station, drainage swale, treed areas, and shoreline • Identification by Navy personnel of area where partial remediation of soils occurred
	Determine the extent of contamination in groundwater. PCBs were detected in 5GW07 - the only shallow well. PCBs may potentially be floating in an oil layer at the top of the groundwater table.	• NA	• PCB, oil and grease, and volatile analysis of groundwater. • TSS and TOC of groundwater
	Define actual and potential exposure risks to public health. Characterize potential of environmental impact to Slocum Creek by comparing contaminant levels detected in the surface waters and sediments to Ambient Water Quality Criteria and literature values. (Note: Site 5 does not appear to be the source of surface water cyanide.)	• PCB, volatile organics, and TOC analyses of soils and groundwater. A few soil boring samples to be analyzed for Target Compounds List. • Cyanide analysis from test pit soil samples. • PCB and TOC analyses of sediments. • TSS of groundwater.	• NA

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TABLE 3-26
SUMMARY OF RI/FS REQUIREMENTS
MCAS, CHERRY POINT, NC
PAGE TWO

Identified Contamination	Objective	Additional Data Required to Estimate Risks and Potential Remedial Alternatives	
		Risk	Engineering
SITE 5 – CONTINUED			
	Evaluate treatability	• NA	• BTU content of soils, sediment, and oil layer (if present) at top of groundwater table. • Grain size and bulk density of soils. • total petroleum hydrocarbons concentration and pH of groundwater • Moisture content of soils and sediments. • PCB and TOC analyses for all media.
SITE 10			
Soils: • Arsenic and other metals **Groundwater:** • Volatile organics, naphthalene, beta-BHC, arsenic, cadmium, and other metals **Sediments:** • Arsenic and other metals **Surface Water:** • Volatiles, arsenic, and other metals • Phenolics	Determine the approximate extent of soil contamination in landfill. The south side of the landfill and the area northeast of Turkey Gut has not been adequately characterized	• NA	• Results from soil gas sampling, visual investigation, examination of aerial photographs • Results from analysis of TOC, volatiles, and metals analysis of soils. A few samples to be analyzed for Target Compound List

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TABLE 3-26
SUMMARY OF RI/FS REQUIREMENTS
MCAS, CHERRY POINT, NC
PAGE THREE

Identified Contamination	Objective	Additional Data Required to Estimate Risks and Potential Remedial Alternatives: Risk	Additional Data Required to Estimate Risks and Potential Remedial Alternatives: Engineering
SITE 10 – CONTINUED			
	Define actual and potential exposure risks to public health. Characterize the potential of environmental impact to Turkey Gut and Slocum Creek.	• Volatiles, metals, hardness, and TSS analyses of surface water. Filtered and unfiltered analysis required for metals • Target Compound List metals and VOAs (including xylenes) and TOC analyses of sediments and lagoon samples • Target Compound List metals and VOAs (including xylenes) analyses of groundwater at the mouth of Turkey Gut. Filtered and unfiltered analysis required for metals • TOC, volatiles, metals, and TSS analyses of groundwater. Filtered and unfiltered analysis required for metals • TOC, CEC, Target Compound List metals and VOAs (including xylenes) analysis of test pit soil samples. One sample at each test pit location will be analyzed for TOC, volatiles, and metals only.	• NA
	Define the boundaries of RCRA surface impoundments and investigate influence in landfill.	• Target Compound List analyses of impoundment soil borings.	• Target Compound List and TOC analysis for impoundment soil borings in location underlying the excavation • Volatiles and metals analyses of groundwater
	Locate the former sludge lagoon as a potential point source.	• NA	• Results from visual investigation, examination of aerial photographs • Target Compound List and TOC analyses of the majority of samples
	Develop an understanding of groundwater flow	• NA	• Water level measurements

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TABLE 3-26
SUMMARY OF RI/FS REQUIREMENTS
MCAS, CHERRY POINT, NC
PAGE SIX

Identified Contamination	Objective	Additional Data Required to Estimate Risks and Potential Remedial Alternatives	
		Risk	Engineering
SITE 17			
Soils: • PCBs **Sediments:** • PCBs	Determine the approximate extent of contamination.	• NA	• PCB, total petroleum hydrocarbon, and TOC analyses of surface and subsurface soils and sediments.
	Determine if PCBs have migrated to groundwater.	• NA	• PCB analyses of subsurface soils just above the groundwater table in locations of highest PCB detections in overlying soils • Groundwater sampling for PCBs, total petroleum hydrocarbon, and TSS.
	Define actual and potential exposure risks to public health. Characterize environmental impact to Schoolhouse Branch.	• PCBs, total petroleum hydrocarbon, and TOC analyses of soils associated with drainage ditch. • Groundwater sampling for PCBs, total petroleum hydrocarbon, and TSS. • PCBs, total petroleum hydrocarbon, and TOC analyses of sediments	• NA
	Evaluate treatability	• NA	• PCB and total petroleum hydrocarbon analyses of soils. • BTU and moisture content of soils • BTU of oil layer (if present) at top of groundwater table. • Grain size and bulk density of soils • Groundwater sampling for PCBs, total petroleum hydrocarbon, and TSS

BTU British Thermal Unit
BOD Biochemical Oxygen Demand
CEC Cation Exchange Capacity
PCBs Polychlorinated biphenyls
TOC Total Organic Carbon

NA Not Applicable

TSS Total Suspended Solids
GW Groundwater
HNU Photoionizer
OVA Organic Vapor Analyzer

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- Level C - Laboratory Analysis Requiring Non-CLP but EPA-Approved Methods
  Used to investigate sites not on the NPL and not likely to be undergoing litigation.

- Level E - Laboratory Analysis Requiring Non-CLP but EPA-Approved Methods
  Used to investigate a non-NPL site that has a low probability of litigation.

DQOs and the analytical options selected to support the DQOs are described in the analysis tables of Section 4.3.4.

4.0 WORK ASSIGNMENT TASK PLAN

This section presents a description of each task to be performed during the RI/FS at the Department of the Navy, Cherry Point MCAS, Sites 5, 10, 16, and 17. Where possible, tasks will reflect all four sites as an integral unit to avoid redundancies and provide economy of savings. The rationale for all activities described in these tasks has been presented in detail in Section 3.0. It is the purpose of this section to summarize the activities that will be conducted and to present the sequence in which the events will occur.

The RI/FS consists of the standard RI/FS tasks described in the Office of Solid Waste and Emergency Response (OSWER) Directive 9242.3-7, November 13, 1986, Standard RI/FS Tasks Under REM Contracts. The following are the standardized RI/FS tasks used in this Work Plan:

- Task 1 - Project Planning
- Task 2 - Community Relations
- Task 3 - Field Investigations
- Task 4 - Sample Analysis/Data Validation
- Task 5 - Data Reduction and Evaluation/Computer Modeling
- Task 6 - Assessment of Risks
- Task 7 - Treatability Study/Pilot Testing
- Task 8 - Remedial Investigation Report
- Task 9 - Remedial Alternatives Screening
- Task 10 - Remedial Alternatives Evaluation
- Task 11 - Feasibility Study Report
- Task 12 - Post-RI/FS Support
- Task 13 - Enforcement Support
- Task 14 - Miscellaneous Support
- Task 15 - ERA (Expedited Response Actions) Planning

4.1 TASK 1 – PROJECT PLANNING

Task 1 includes the completion of the following activities:

- Initiation of Project Work Assignment
- Participation in RI/FS Brainstorming Session

- Preparation of Project Work Plan (WP)
- Preparation of Field Operations Plan (FOP)
- Development of ARARs
- Development of Data Quality Objectives (DQOs)

4.1.1 Brainstorming Activities

On August 29, 1988, a project meeting was conducted. Representatives of the Department of the Navy (Navy) and NUS attended this meeting. The RI/FS process, in accordance with EPA guidelines, was discussed at length. In addition, the technical scope of work was discussed and the general scope of activities was established for the four sites of concern.

Internal brainstorming sessions held at NUS on October 5, 1988, and October 10, 1988, provided a more site-specific scope of activities. Results were summarized and sent to the Department of the Navy via the correspondence of November 21, 1988.

Additional revisions were incorporated, following a Navy/NUS review meeting held March 29, 1989. Two major changes were made at this meeting, as follows:

- The Navy supplied new information on recent work at Sites 5 and 10. At Site 5, sampling associated with RCRA closure of Tank 1771 was conducted. At Site 10, eleven new non-NUS monitoring wells were sampled to investigate the wastewater treatment plant polishing ponds, determine tidal influences, and investigate the surface impoundment within Site 10.

- The Navy decided to perform the work in phases. Phase I work is clearly identified herein. Additional phases may be required to finalize nature and extent of contamination.

Final selection of monitoring well and boring locations were made in May 1990 after results of soil gas surveys for Site 5, 10, and 16 were reviewed.

4.1.2 Preparation of Work Plan

This report, the Work Plan for the Department of the Navy, Cherry Point Sites 5, 10, 16, and 17 RI/FS, presents the technical scope and schedule for Phase I. It is anticipated that Phase II activities, specifically additional field sampling, may be required.

4.1.3 Preparation of Field Operations Plan (FOP)

The Field Operations Plan (FOP) for Phase I includes sampling and analytical objectives; the number, type, and location of all samples to be collected during the field investigation; the site-specific quality assurance requirements; and detailed procedures for field activities. Appended to the FOP is the Health and Safety Plan (HASP).

The HASP includes site-specific information on health and safety requirements, a hazard assessment, training requirements, monitoring procedures for site operations, safety and disposal procedures, and other requirements.

Task 1 will be completed upon approval of the Work Plan and the Phase I FOP. However, preparation of the FOP will not begin until after EPA review and comment on the Work Plan.

4.2 TASK 2 – COMMUNITY RELATIONS

Community relations activities, such as Technical Review Committee (TRC) meetings, will be required but will scoped/budgeted separately from this Work Plan, on an as required basis.

4.3 TASK 3 – FIELD INVESTIGATION

The Field Investigation task of the Phase I RI consists of four subtasks as shown below:

- 4.3.1 Procurement of Subcontractors
- 4.3.2 Mobilization/Demobilization
- 4.3.3 Hydrogeologic Investigation and Screening Activities
    - 4.3.3.1 Site 5 - Storage Tanks for Waste Petroleum, Oil, and Lubricant (POL)
    - 4.3.3.2 Site 10 - Old Sanitary Landfill
    - 4.3.3.3 Site 16 - Landfill at Sandy Branch
    - 4.3.3.4 Site 17 - Defense Reutilization and Marketing Office (DRMO)
- 4.3.4 Media Sampling
    - 4.3.4.1 Site 5 - Storage Tanks for Waste Petroleum, Oil, and Lubricant (POL)
    - 4.3.4.2 Site 10 - Old Sanitary Landfill
    - 4.3.4.3 Site 16 - Landfill at Sandy Branch
    - 4.3.4.4 Site 17 - Defense Reutilization and Marketing Office (DRMO)

4.3.1 Procurement of Subcontractors

Under this subtask, technical specifications for bidding purposes will be prepared and subcontractors will be procured for specific RI activities. The objective of these activities is to develop and place bid solicitations at the earliest possible date for subcontractors required to start the RI activities. The subcontracts that will be prepared as part of the initial tasks identified at this time is for the Phase I drilling and monitoring well installation and development.

4.3.2 Mobilization/Demobilization

This subtask will consist of field personnel orientation (NUS and subcontractor personnel) and equipment mobilization, and will be performed at the initiation of each phase of field activities, as necessary. A field team orientation meeting will be held to familiarize NUS and subcontractor personnel with the site history, health and safety requirements, and field procedures.

Equipment mobilization/demobilization will include the setup and removal of the following equipment:

- Surveying
- Field office trailers
- Drilling subcontractor equipment
- Sampling equipment
- Health and safety and decontamination equipment handling
- Utility hook-ups

Each site will require an appropriate decontamination facility that meets all applicable OSHA, EPA, and State of North Carolina requirements. Site-specific requirements will be developed in the Field Operations Plan (FOP).

4.3.3 Hydrogeologic Investigation and Screening Activities

The primary purpose of the hydrogeologic investigation is to better define the sources, nature, and extent of groundwater contamination at the MCAS, Cherry Point sites of concern. In addition, information concerning the geology and aquifer characteristics will be collected and interpreted for the study areas included in the RI/FS.

The hydrogeologic investigation will focus on the areas of concern as determined by the Remedial Investigation Interim Report (NUS, November 1988) which include the following:

- Site 5 - StorageTanks for Waste Petroleum, Oil, and Lubricant (POL)
- Site 10 - Old Sanitary Landfill
- Site 16 - Landfill at Sandy Branch
- Site 17 - Defense Reutilization and Marketing Office (DRMO)

Each of these sites is treated in detail in Sections 4.3.3.1 through 4.3.3.4, as each is a separate entity yet part of the scope of this RI/FS. The Interim RI Report indicates groundwater contamination at Sites 5, 10, and 16. No data is available for groundwater at Site 17; however, the possibility exists that transformer oil, contaminated with PCBs, has migrated to groundwater at this site.

A standardized well-numbering scheme will be used throughout the project. Wells will be numbered first by site and then in a sequential order, continuing the numbering scheme from the Interim RI Report (NUS, November 1988). Note that at Site 10, 11 new non-NUS monitoring wells, which were not addressed in the interim RI Report, have recently been installed. Therefore, numbering of wells at Site 10 will continue where the non-NUS monitoring wells left off.

It is anticipated that the monitoring well borings will be drilled using hollow-stem augers (6-inch or 8-inch I.D.) in the overburden. Site conditions or other considerations may result in the use of alternate drilling methods (air rotary, cable tool, etc.).

It is assumed that all drilling and well construction activities will be completed in Level D protective equipment. This may change if, during preparation of the HASP, it becomes apparent that higher levels of Personal Protective Equipment (PPE) will be necessary. It has been assumed that any water generated during drilling, well construction, well testing, and sampling which registers a reading on an HNu, may be disposed of in drums pending approval by EPA and the State of North Carolina. All other water will be disposed of on site. It is assumed that any drill or test pit soil material can be disposed of in-place or on site.

In general, one type of well construction will be used during the field investigation. Wells will be constructed using sand packed 2-inch (and 4-inch, in selected locations) PVC well screens. Screens will generally be 5 to 15 feet long, though screen lengths will be determined in the field, depending on site-specific hydrogeologic considerations. It is expected that 10-slot well screens will be used to construct the overburden monitoring wells. The field geologist may modify this as conditions warrant. Well screens will not be placed across lithologic boundaries or installed into sediments considered to exhibit low permeability. A standard overburden monitoring well is depicted in Figure 4-1.

Information resulting from a planned Navy aquifer testing program (i.e., pump test) used to evaluate the aquifer's transmissivity, storativity, and distance/drawdown relationships will be made available to NUS.

The Phase I hydrogeologic task will include an assessment to determine whether additional investigation is required for the risk assessment and to evaluate remedial alternatives. Following an assessment of the field investigation findings, a meeting will be held between the Department of the Navy and NUS to evaluate the requirements for the Phase II investigation.

4.3.3.1 Site 5 – Storage Tanks for Waste Petroleum, Oil, and Lubricant (POL)

Phase I

During completion of the Interim RI Report, volatile organics were detected in monitoring wells. Also, PCB contamination was detected in monitoring well 5GW07. This well is screened at the top of the water table, whereas the remaining wells at the site are screened below the water table. This detection indicates that the PCBs may be dissolved in a floating oil layer. Therefore, to evaluate the concentration and extent of PCB contamination at the site, it will be necessary to install additional wells screened at the top of the water table. Synoptic water level measurements will be obtained from all wells within 1 hour, or less, because of the potential influence of tides on groundwater levels. A continuous monitor will be placed on one of the wells to obtain water level measurements for a 1-week period.

To locate possible source areas of contamination soil gas surveys were completed over the areas indicated on Figures 4-2a and 4-2b. Results of the survey are shown on Figure 4-2a. Monitoring wells and soil borings were, in part, located to address zones of peak anomalies.

A topographic survey will be completed to accurately locate the relative positions of Tank 1771, Tank 1129, dismantled Building 90, the transformer station, drainage swales, vegetated areas, the shoreline, and monitoring well, soil boring, and sampling locations. During completion of the survey, Navy personnel will identify the area where partial remediation of PCB-contaminated soils occurred.

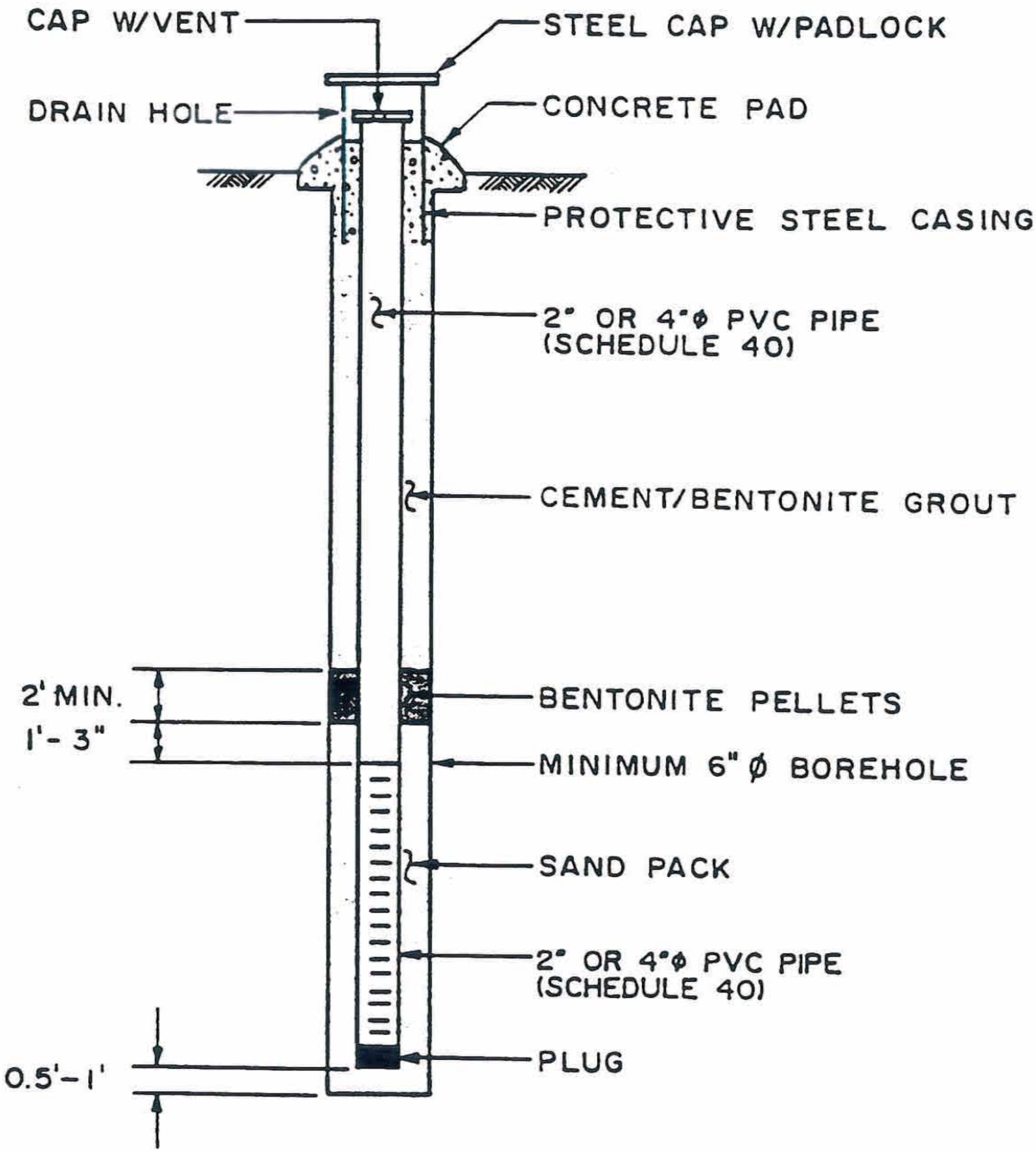
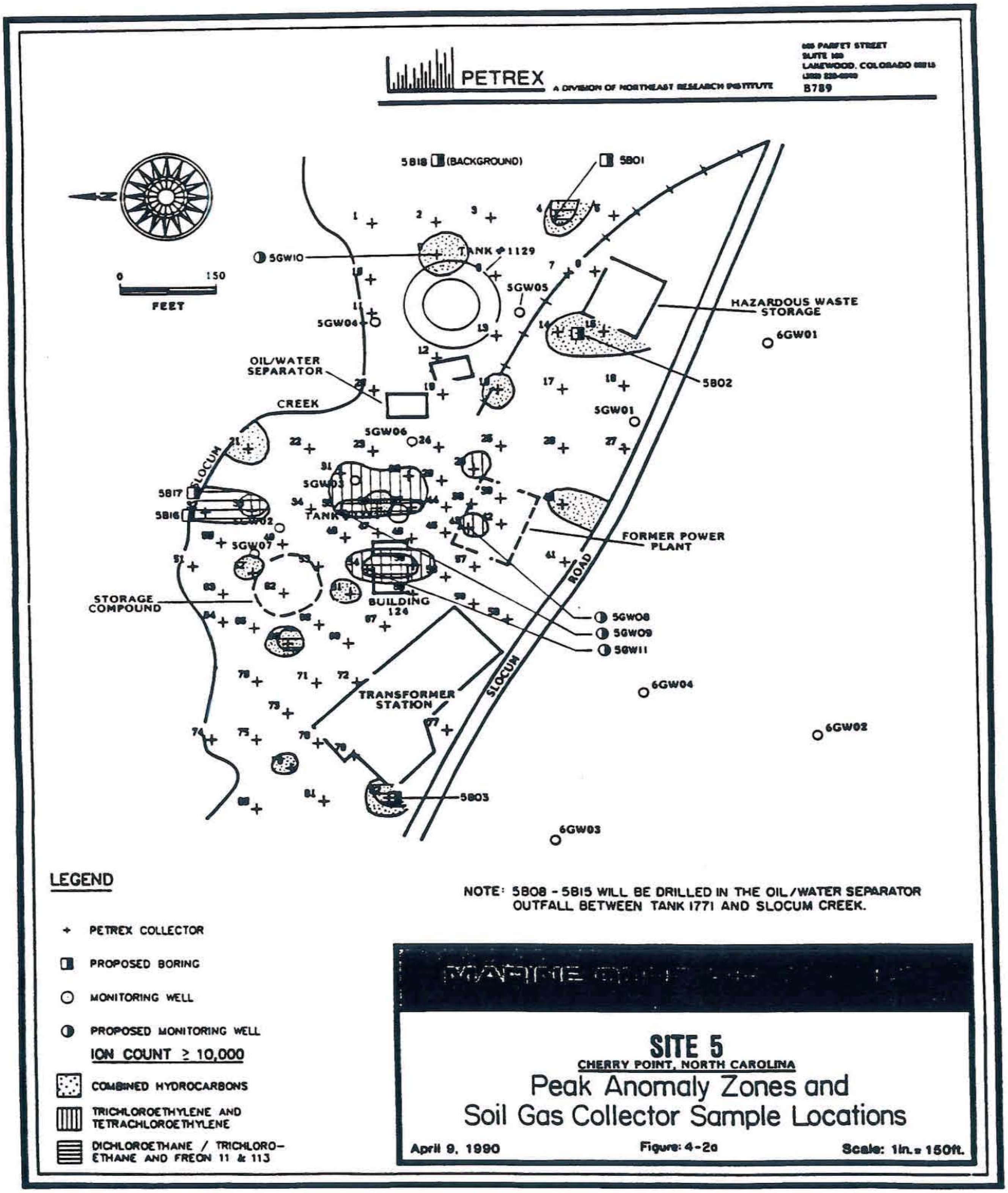
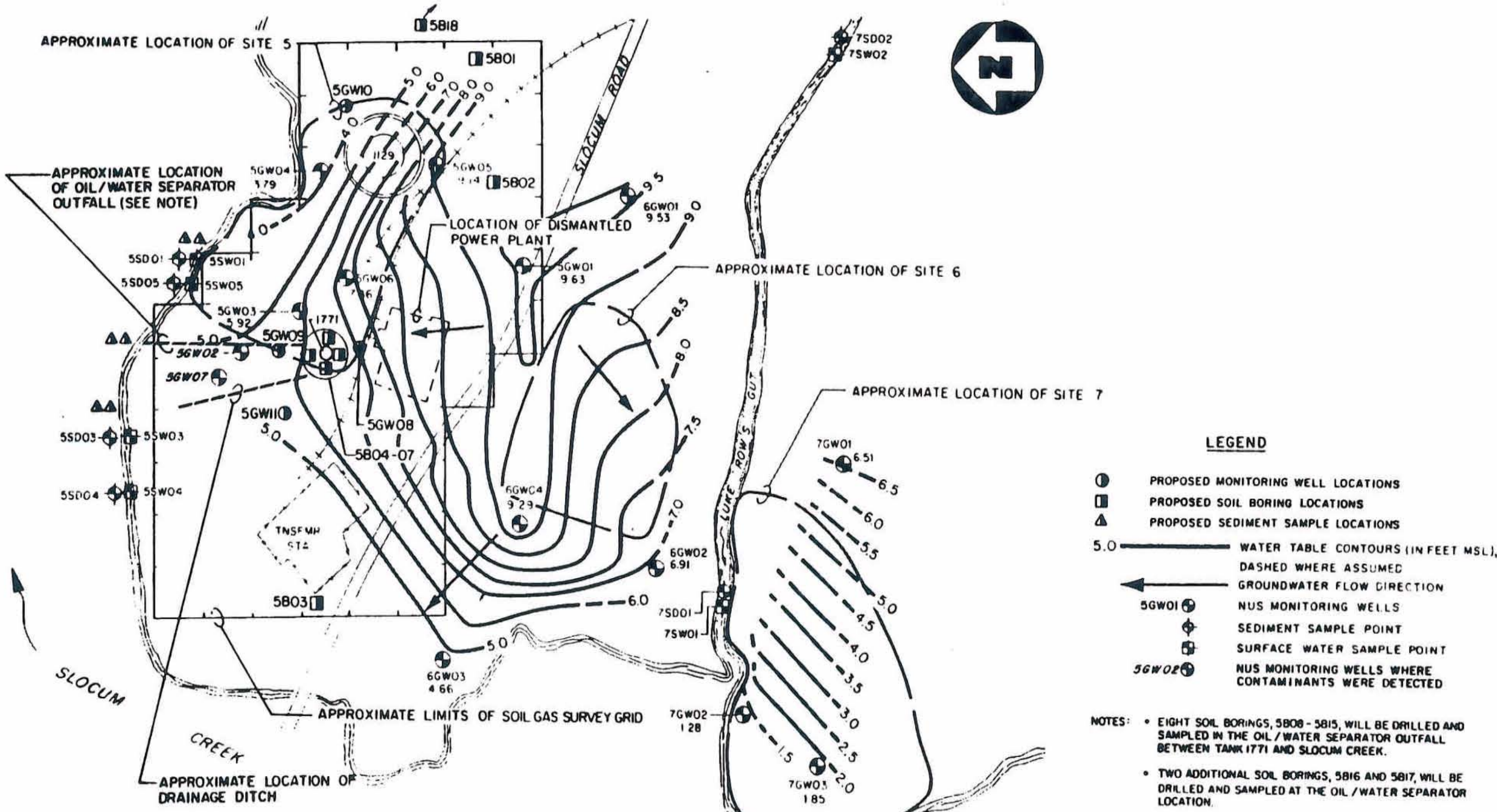


FIGURE 4-1

OVERBURDEN MONITORING WELL
STANDARD INSTALLATION
MCAS CHERRY POINT, NC
NOT TO SCALE

NUS CORPORATION


PETREX
A DIVISION OF NORTHEAST RESEARCH INSTITUTE
B789
5B18 (BACKGROUND)
5B01
0 150
FEET
5GW10
TANK #1129
5GW05
5GW04
HAZARDOUS WASTE STORAGE
6GW01
OIL/WATER SEPARATOR
5B02
CREEK
5GW01
5GW06
SLOCUM
5B17
5B16
5GW03
TANK
5GW02
5GW07
FORMER POWER PLANT
ROAD
STORAGE COMPOUND
BUILDING 124
5GW08
5GW09
5GW11
6GW04
TRANSFORMER STATION
SLOCUM
6GW02
5B03
6GW03
LEGEND
PETREX COLLECTOR
PROPOSED BORING
MONITORING WELL
PROPOSED MONITORING WELL
ION COUNT ≥ 10,000
COMBINED HYDROCARBONS
TRICHLOROETHYLENE AND TETRACHLOROETHYLENE
DICHLOROETHANE / TRICHLOROETHANE AND FREON 11 & 113
NOTE: 5B08 - 5B15 WILL BE DRILLED IN THE OIL/WATER SEPARATOR OUTFALL BETWEEN TANK 1771 AND SLOCUM CREEK.
SITE 5
CHERRY POINT, NORTH CAROLINA
Peak Anomaly Zones and Soil Gas Collector Sample Locations
April 9, 1990
Figure: 4-2a
Scale: 1in. = 150ft.



EXACT LOCATIONS OF SEDIMENT SAMPLES TO BE DETERMINED DURING THE FIELD INVESTIGATION. SAMPLING WILL OCCUR AT DISCHARGE POINT OF OIL/WATER SEPARATOR OUTFALL AND 100 FT. IN BOTH DIRECTIONS FROM THE DISCHARGE POINT.

SITE 5
PROPOSED SAMPLING LOCATIONS (PHASE I)
AND GROUNDWATER CONTOUR MAP
MCAS CHERRY POINT, NC

FIGURE 4-2b

0 200 400
SCALE IN FEET

NUS CORPORATION

1457

In summary, the Phase I hydrogeologic investigation at Site 5 consists of the following activities:

- Survey site features.
- Survey the horizontal location and vertical elevation of the ground surface, the uncapped well riser, and the top of the protective casing of the monitoring wells to be installed during this investigation.
- Survey the horizontal locations and ground surface elevations of all the soil borings being placed within the site during the field investigation, and all sediment sample locations.
- Drill and install four shallow monitoring wells.
- Drill three soil borings at soil gas anomaly areas (5B01, 5B02, 5B03) four borings around Tank 1771 (5B04-5B07), eight borings between Tank 1771 and the oil/water separator outfall (5B08-5B15), two borings at the oil/water separator outfall (5B16, 5B17) and one "background" boring at 5B18 (see Figure 4-2b).
- Obtain synoptic water level measurements.
- Conduct slug tests at each well to determine aquifer characteristics.
- Collect one round of groundwater samples at each newly installed well.
- Resample existing Monitoring Wells 5GW01, 5GW02, 5GW04, 5GW05, and 5GW07.

The rationale for locating the four proposed monitoring wells is listed in Table 4-1a. These locations, shown in Figure 4-2a and 4-2b, were selected based on the groundwater contour maps prepared for the Interim RI Report (NUS, November 1988) and the results of the soil gas survey (April 1990). Soil boring location rationale is presented in Table 4-1b.

The four proposed wells will be constructed of 2-inch PVC well screens and risers. To allow for fluctuations of the water level, they will be screened 3 feet below and 2 feet above the water table. Each well is estimated to be 10-feet deep, for a total estimated monitoring well footage of 40 feet. After the wells have been installed and developed, a slug test will be completed on each well to determine the hydraulic conductivity of the aquifer in the vicinity of the well. Borings will be drilled

TABLE 4-1a

SITE 5
CRITERIA FOR PLACEMENT OF MONITORING WELLS
MCAS, CHERRY POINT, NC

Well Number	Rationale
5GW08	• Chemical data collection downgradient of the former power plant at soil gas sample location No. 43. • Water-level measurements.
5GW09	• Chemical data collection downgradient of Tank 1771 at soil gas sample location No. 35. • Water-level measurements.
5GW10	• Chemical data collection downgradient of Tank 1129, near soil gas sample location No. 9 (hydrocarbon peak), and near existing well 5GW04. • Water-level measurements.
5GW11	• Chemical data collection downgradient of building 124 at soil gas sample location No. 54. • Water-level measurements.

TABLE 4-1b

SITE 5
CRITERIA FOR PLACEMENT OF BORINGS
MCAS, CHERRY POINT, NC

Boring Number	Rationale
5B01	Investigate potential source areas at Soil Gas Anomaly Sample Location No. 4.
5B02	Investigate potential source area between Soil Gas Anomaly Sample Location Nos. 14 and 15 (near vicinity of the Hazardous Waste Storage Area).
5B03	Investigate potential source area at Soil Gas Anomaly, Sample Location No. 82 (near vicinity of transformer station western boundary).
5B04-5B07	Obtain soil samples around Tank 1771 for PCB analysis.
5B08-5B15	Obtain soil samples between Tank 1771 and Slocum Creek for PCB analysis.
5B16, 5B17	Obtain soil samples at the oil/water separator outfall.
5B18	Obtain background sample.

to the water table. Four borings (5B01, 5B02, 5B04, and 5B03) will be drilled to the first major confining layer. All borings will be backfilled with bentonite.

4.3.3.2 Site 10 – Old Sanitary Landfill

Phase I

Because contamination was detected at Site 10 during completion of the Interim RI Report, 12 additional monitoring wells will be installed at the locations shown on Figure 4-3a and 4-3b. These proposed wells will be used to further define groundwater contamination, flow direction and aquifer characteristics at Site 10. Well locations were selected; (1) to help define groundwater in areas where wells previously were not located, and (2) to evaluate peak anomaly areas identified by the soil gas survey (April 1990) that might represent major sludge disposal or drum burial areas within the landfill. One of the monitoring wells (10GW42) will be installed to the south of the surface impoundment to better define groundwater contamination in this area.

Synoptic water level measurements at all Site 10 wells will be taken within 1 hour or less. It is important that these readings are taken nearly at the same time because Site 10 groundwater is influenced by tides. A continuous monitor will be placed on one of the wells to obtain water level measurements for a 1-week period.

To support the data needs of the solute transport evaluation (groundwater model activity), and help define local surface water/groundwater interactions, two staff gauges will be installed at the locations :ated on Figure 4-3b. One gauge will be placed in Turkey Gut and the other will be placed in Slocum Creek. In addition, it will be necessary to determine the depth, and the minimum and maximum flow of Turkey Gut and Slocum Creek. To determine the difference in stream flows, caused by seasonal fluctuations in precipitation, it may be necessary to make additional trips to the site.

To obtain information on the physical characteristics of the aquifer, two Shelby tubes will be obtained and sent to a laboratory for analysis of porosity and unit weight. Shelby tube samples will be collected from the confining layer at well location Nos. 10GW44 and 10GW36.

4.3.3.4 Site 17 – Defense Reutilization and Marketing Office (DRMO)

Phase I

To evaluate whether the groundwater at Site 17 is contaminated with PCBs, two monitoring wells will be installed and sampled at the locations shown on Figure 4-5. Because Sites 15, 16, and 17 are in proximity to each other, a water level reading will be obtained from all three sites within 1 hour, or less. The time limitation is important because groundwater levels are under the potential influence of tides.

In summary, the Phase I hydrogeologic investigation at Site 17 will consist of the following activities:

- Survey the horizontal location and vertical elevation of the ground surface, the uncapped well riser, and the top of the protective casing of each of the monitoring wells to be installed during this investigation.

- Survey the horizontal locations and ground surface elevations of all the soil and sediment samples being taken within the site during the field investigation.

- Drill, install, and sample two shallow monitoring wells.

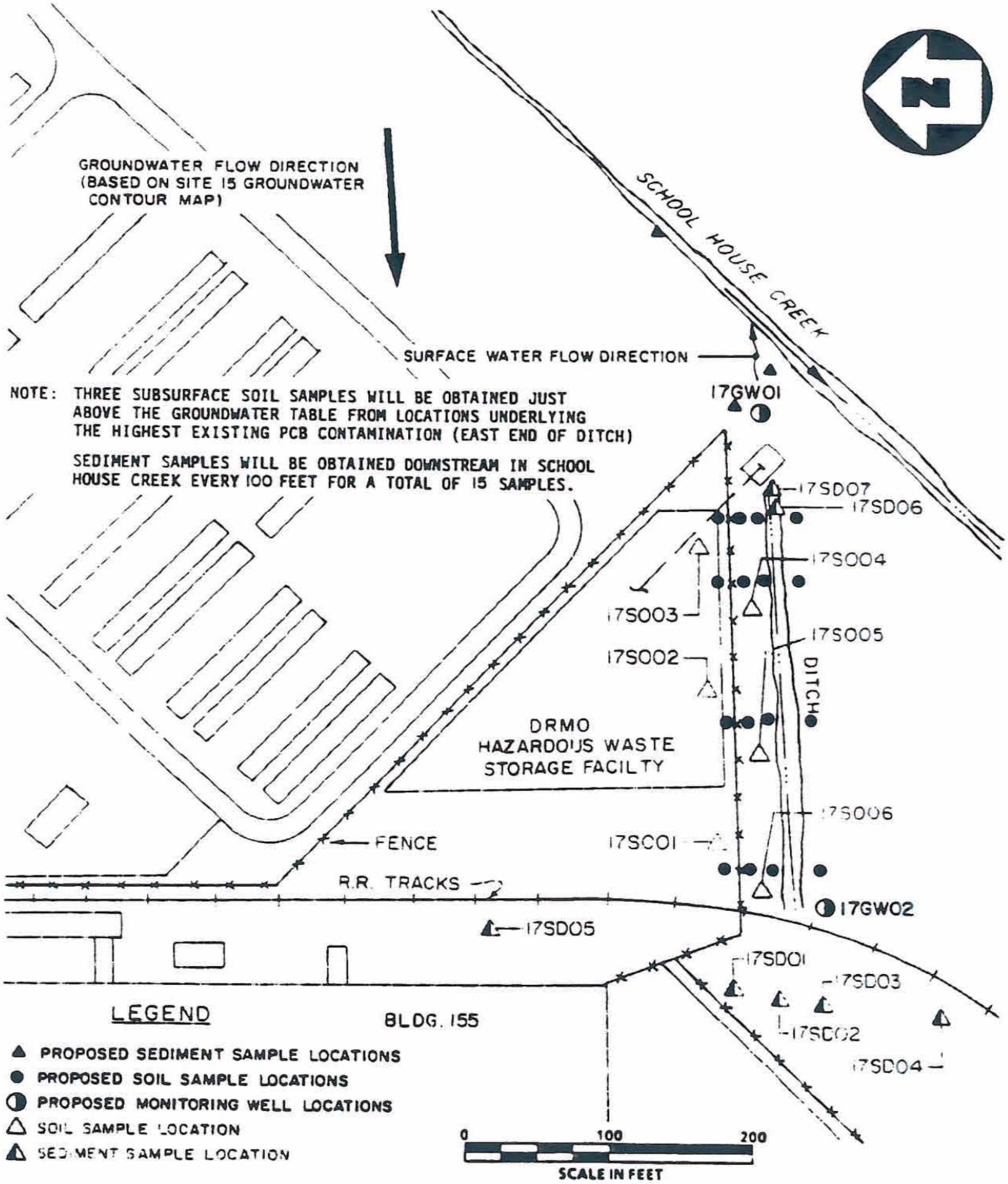
- Perform synoptic water level measurements.

- Conduct slug tests at each well.

- Collect one round of groundwater samples at each newly installed well.

The rationale for locating the two proposed monitoring wells is listed in Table 4-4. These locations, shown in Figure 4-5, were selected based on the groundwater contour maps prepared for the Interim RI Report (NUS, November 1988).

The proposed wells will be constructed of 2-inch PVC well screens and risers. To allow for fluctuations of the water level, screens will be 10 feet long. Each well will be drilled until the confining layer is encountered. Borings are anticipated to be 40 feet deep for a total drilling footage of 80 feet. Each well is estimated to be 15-feet deep for a total estimated monitoring well footage of 30 feet. After the wells have been installed and developed, a slug test will be completed in each well to determine the hydraulic conductivity of the aquifer in the area of the well.



SITE 17
PROPOSED SAMPLING LOCATIONS (PHASE I)
AND GROUNDWATER CONTOUR MAP
MCAS CHERRY POINT, NC

FIGURE 4-5

NUS CORPORATION

TABLE 4-4

SITE 17
CRITERIA FOR PLACEMENT OF MONITORING WELLS
MCAS, CHERRY POINT, NC

Well Number	Rationale
17GW01	• Chemical data collection at east end of ditch to determine whether groundwater is contaminated with PCBs. • Depth to confining layer for evaluating possibility of Site 16 contaminant migration to underlying aquifers. (Site 17 is in proximity to Site 16, where noncontinuous confining layers are probable.) • Water-level measurements.
17GW02	• Chemical data collection at west end of ditch to determine whether groundwater is contaminated with PCBs. • Depth to confining layer for evaluating possibility of Site 16 contaminant migration to underlying aquifers. (Site 17 is in close proximity to Site 16, where noncontinuous confining layers are probable.) • Water-level measurements

Phase II

Phase I results may indicate that groundwater is not contaminated. Conversely, if contamination is present, additional monitoring wells will be required as part of Phase II to determine the extent of contamination.

4.3.4 Media Sampling

Sections 4.3.4.1 through 4.3.4.4 present the Phase I sampling and analytical program proposed for Sites 5, 10, 16, and 17. Quality control/quality assurance samples (trip blanks, field blanks, rinsate blanks) required by the Navy quality assurance program (Naval Energy and Environmental Support Activity, June 1988) are included in the total number of samples proposed for each site. The number of rinsate samples scheduled for each site is tentative and is subject to change based on the duration of the field sampling program. Laboratory quality control/quality assurance samples are not included in the total number of samples proposed for each site.

4.3.4.1 Site 5 – Storage Tanks for Waste Petroleum, Oil, and Lubricant (POL)

Phase I

The proposed sampling plan on Table 4-5 and Table 4-6 is a summary of the number of field samples.

Groundwater

Volatile organic compounds and PCBs were detected in monitoring wells 5GW02 and 5GW07, respectively, during the Interim RI Rounds 1, 2, and 3 sampling investigations. To further define the nature and extent of groundwater contamination, six existing monitoring wells (5GW01, 5GW02, 5GW03, 5GW04, 5GW05, and 5GW07) and four newly installed monitoring wells (5GW08, 5GW09, 5GW10, and 5GW11) will be sampled. Table 4-7 summarizes the groundwater sampling and analysis program. To support site characterization and the risk assessment, groundwater samples will be analyzed for the following:

- Target Compound List Volatile Organics
- PCBs
- Total Suspended Solids (TSS)

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TABLE 4-5

SITE 5
PROPOSED SAMPLING PLAN
MCAS, CHERRY POINT, NC

Sample Matrix	Location/Depth	Number of Samples	Rationale
Groundwater	5GW01, 5GW02, 5GW03, 5GW04, 5GW05, 5GW07, 5GW08, 5GW09, 5GW10, and 5GW11	10 - 1 sample per well	Evaluate the presence and extent of volatiles/PCB contamination in the site shallow groundwater aquifer
Floating Product (Optional)	May be present at locations 5GW07, 5GW08, 5GW09, 5GW10, 5GW11	Up to 5 samples may be collected	Evaluate the nature of contamination
Soil	• 4 soil borings around Tank 1771, 2 soil borings at the oil/water separator location, and 1 upgradient location; samples collected every 2 1/2 ft depth down to 10 ft. • 8 soil borings drilled in drainage ditch from Tank 1771 to Slocum Creek - samples collected at 2 -foot depth and above the water table.	• 28 - 4 per boring • 16 total - 2 per boring	Support closure for Tank 1771. Evaluate presence and extent of contamination at suspected hazardous waste source areas at Site 5. Also, evaluate extent of residual PCB contamination remaining after cleanup efforts by MCAS, Cherry Point. Collect data for evaluation of remedial alternatives.
Sediments	3 sampling locations: • Upgradient of oil/water separator outfall at Slocum Creek. • At discharge point of drainage oil/water separator outfall at Slocum Creek. • Downgradient to oil/water separator outfall at Slocum Creek. 2 samples collected at each location on transect perpendicular to the bank of Slocum Creek at 2 feet and 4 feet from the edge of the bank	6 total	Investigate for PCB contamination possibly migrating to Slocum Creek via groundwater recharge of Slocum Creek or surface water runoff.

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TABLE 4-6

SITE 5
SUMMARY OF FIELD SAMPLING AND ANALYSIS PROGRAM
MCAS, CHERRY POINT, NC

Parameter	Number of Samples[a]		
	Groundwater[c][d]	Sediments	Soils
Full TCL Organics and Metals*	--	--	28
TCL Volatiles[b]	10	--	19
PCBs	10	6	19
Total Suspended Solids	10	--	--
Total Organic Carbon	5	6	8
Total Petroleum Hydrocarbons	10	--	47
British Thermal Units	--	--	4
Density	--	--	4
Grain Size	--	--	4

(a) Number of samples does not include field QA/QC samples.
(b) TCL - Target Compound List
(c) pH analyses of all water samples will be conducted in the field.
(d) If floating product is encountered in any of the shallow wells, analysis will be conducted for PCBs, BTU, flashpoint and GC fingerprinting.
* Full TCL organics and metals are proposed for soil samples, associated with RCRA closure of Tank 1771.

TABLE 4-7

SITE 5
LABORATORY ANALYSIS OF GROUNDWATER SAMPLES[d]
MCAS, CHERRY POINT, NC

Matrix - Water

Parameter	Analytical Method	DQO Level	Total Number of Environmental Samples	Trip Blanks	Field and/or Rinsate Blanks	Field Duplicates 1/10	Grand Total [c]
TCL Volatiles[a]	CLP[b]	C	10	2	1/1	1	15
PCBs	CLP[b]	C	10	--	1/1	1	13
Total Suspended Solids (TSS)	EPA 160.2	C	10	--	--	1	11
Total Organic Carbon (TOC)	EPA 415.1	C	5	--	--	1	6
Total Petroleum Hydrocarbons	EPA 418.1	C	10	--	--	1	11

Notes:
(a) TCL - Target Compound List
(b) CLP - Contract Laboratory Program
(c) Does not include Laboratory QA/QC samples.
(d) If floating product is encountered in any of the shallow wells, analysis will be conducted for PCBs, BTU, flashpoint, and GC fingerprinting.
PCBs Polychlorinated biphenyls

- Total Petroleum Hydrocarbons
- Total Organic Carbon (TOC)

If a floating product/waste layer is detected in the shallow monitoring wells (5GW07, 5GW08, 5GW09, 5GW10, or 5GW11), samples of the floating material will be collected and analyzed for GC Fingerprinting, flashpoint, PCBs, and BTU.

Target Compound List volatile organics and PCBs were selected because these constituents were detected in previous investigations and are considered the primary contaminants of concern at the site. TSS provides an indication as to whether the PCBs exist in groundwater as contaminants adsorbed to soil particles or are present as a dissolved solute. BTU, total petroleum hydrocarbons and TOC are required to evaluate potential remedial technologies.

Soils

Sampling and analysis of groundwater during the Interim RI Round 1, 2, and 3 sampling investigations indicated the presence of volatile organic compounds and PCBs in monitoring well 5GW07. The source of this contaminant has not been adequately defined in these investigations. Potential sources include Tank 1771 and the oil/water separator outfall extending from Tank 1771 to Slocum Creek, the former power plant (Building 90) located east of Tank 1771, and the transformer station located in the western portion of the site.

To determine whether these potential source areas are associated with the contaminants detected in previous groundwater sampling investigations, and to evaluate potential public health and environmental effects, surface and/or subsurface soil samples will be obtained from each source area. Figures 4-2a and 4-2b detail the proposed soil sampling locations. Sample analyses are summarized in Table 4-8.

As the first step of the field investigation, site features will be surveyed so that the proposed samples can be accurately obtained from within the original boundaries. In addition, the location of the proposed soil borings and monitoring wells will be surveyed to determine their position with respect to other site features.

Three borings, 5B01, 5B02, and 5B03 will be located next to smaller zones of peak soil gas anomalies. One sample each will be collected form these borings and analyzed for TCL volatiles, PCBs, and total petroleum hydrocarbons.

TABLE 4-8

SITE 5
LABORATORY ANALYSIS OF SOIL SAMPLES
MCAS, CHERRY POINT, NC

Matrix - Soil

Parameter	Analytical Method	DQO Level	Total Number of Environmental Samples	Trip Blank	Field and/or Rinsate Blanks	Field Duplicates 1/10	Grand Total(c)
Full TCL Organics and Metals*	CLP(a)	C	28(1)	*	*	*	*
TCL Volatiles(b)	CLP(a)	C	19(2)	3	1/1	2	26
PCBs	CLP(a)	C	19(2)	--	1/1	2	23
Total Organic Carbon (TOC)	SW 9060	C	8(3)	--	--	1	9
Density	Agronomy No. 9	C	4(3)	--	--	1	5
Grain Size	ASTM D422	C	4(3)	--	--	1	5
British Thermal Unit	ASTM 3286	C	4(3)	--	--	1	5
Total Petroleum Hydrocarbons	SW3550	C	47	--	--	5	52

(a) CLP - Contract Laboratory Program
(b) TCL - Target Compound List
(c) Does not include laboratory QA/QC samples.
* Full TCL Organics and Metals are proposed for soil samples associated with RCRA closure of Tank 1771. Field QA/QC samples will be specified in the field sampling and analysis plan.
(1) 5B04-5B07, 5B16-5B18.
(2) Two each from 5B08-5B15, one each from 5B01, 5B02, 5B03.
(3) 5B08-5B15.

Tank 1771 was previously used to store waste POL. Spillages from this tank may have contaminated the surrounding soil. To determine whether soil surrounding Tank 1771 is a source of groundwater contamination (and to support RCRA closure of Tank 1771), four soil borings (5B04-5B07) will be drilled around this tank (Figure 4-2). Soil samples will be obtained from each boring every 2 1/2 feet to a depth of 10 feet. The soil boring locations will be decided in the field, based on the visual observation of soil contamination. In addition, two soil borings will be obtained at the oil/water separator location (5B16 and 5B17) and one soil boring will be obtained upgradient (5B18). Again, soil samples will be obtained from each boring every 2 1/2 feet to a depth of 10 feet.

Previous sampling has indicated the presence of PCB-contaminated soils in the oil/water separator outfall between Tank 1771 and Slocum Creek. As discussed in Sections 2.2.1 and 3.1.1, remediation efforts to date included the excavation of contaminated soils to a depth of 6 inches. To further define the extent of residual contamination, and to determine whether the outfall is a potential source of groundwater contamination, eight soil borings will be drilled along the outfall (5B08-5B15). Exact sample locations will be determined during the field investigation. To define the nature and extent of contamination, two soil samples will be collected from each soil boring at depths of 2 feet and above the water table (approximately 5 feet). Surface soils will not be collected from this area because the removed contaminated 6 inches of soil were replaced with clean soil.

Since more comprehensive data is required to support RCRA closure of Tank 1771, samples from Borings 5B04-5B07, 5B16, 5B17, and 5B18 (28) will be analyzed for Target Compound List Organics and total petroleum hydrocarbons.

Volatile organics, PCBs, and total petroleum hydrocarbons were selected for analysis for soil samples near the peak anomaly zones (5B01-5B03) and along the outfall ditch (5B08-5B15) because these constituents were detected in groundwater during the Interim RI and are considered the primary contaminants of concern.

Several soil samples will be analyzed for TOC, BTU, grain size, and density. TOC provides an indication of soil adsorption potential and contaminant mobility in the soil environment. To evaluate potential remedial alternatives, samples will be analyzed for grain size, BTU, and density.

Sediments

Surface water samples from Slocum Creek will not be required as part of the RI. Sufficient data are available from the Rounds 1, 2, and 3 Interim RI sampling investigations.

Sampling and analysis of sediments from Slocum Creek in the vicinity of Site 5 during the Interim RI Rounds 1, 2, and 3 sampling investigations indicated the presence of PCBs. To further define the extent of contamination and to evaluate public health and environmental effects, sediment samples will be obtained from Slocum Creek in the vicinity of the oil/water separator outfall. Two samples will be collected upgradient of the discharge point, two will be collected at the discharge point, and two will be collected downgradient. Sample locations are shown on Figure 4-2b. Sample analyses are summarized in Table 4-9. The six samples will be taken from three transects perpendicular to the bank of Slocum Creek approximately 100 feet apart. At each transect, a sample will be taken 2 feet and 4 feet from the edge of the bank. The samples obtained will be analyzed for PCBs, and TOC to support the risk assessment and site characterization.

4.3.4.2 Site 10 – Old Sanitary Landfill

Phase I

Table 4-10 provides the proposed sampling plan and Table 4-11 provides a summary of number of field samples.

Groundwater

Sampling and analyses of existing and new monitoring wells at Site 10 will be conducted to further define the metals and volatile organic contamination detected during previous site investigations. Some of the existing wells and all of the 12 new wells will be analyzed for Target Compound List metals and volatile organics (plus xylenes), total suspended solids, total organic carbon, and BOD.

Metals analyses will be conducted on filtered and unfiltered samples to differentiate between the metal fraction dissolved in the groundwater and that fraction adsorbed to particulate matter. All existing and new wells are displayed on Figures 4-3a and 4-3b. Groundwater from two of the wells (10GW03 and 10GW36) displayed on Figures 4-3a and 4-3b will be additionally analyzed for base neutral/acid extractable compounds, pesticides, and PCBs. The full analyses are necessary because previous site investigations have not fully investigated the potential groundwater contamination at Site 10. These two wells are located near the mouth of Turkey Gut.

The sampling and analyses planned for existing and new site monitoring wells serve to further characterize site groundwater contamination and are necessary for the solute transport evaluation planned for this site. The existing monitoring well locations are concentrated around the surface impoundments and the northern section of the Site 10 landfill. The new monitoring well locations

TABLE 4-9

SITE 5
LABORATORY ANALYSIS OF SEDIMENT SAMPLES
MCAS, CHERRY POINT, NC

Matrix - Soil

Parameter	Analytical Method	DQO Level	Total Number of Environmental Samples	Field and Rinsate Blanks	Field Duplicates 1/10	Grand Total[b]
PCBs	CLP[a]	C	6	1/1	1	9
Total Organic Carbon (TOC)	SW 9060	C	6	--	1	7

[a] CLP - Contract Laboratory Program
[b] Does not include laboratory QA/QC samples.

4.3.4.4 Site 17 – Defense Reutilization and Marketing Office (DRMO)

Phase I

Refer to Table 4-21 for information on the proposed sampling plan and Table 4-22 for a summary of number of field samples.

Groundwater

PCBs were detected in soil and sediment during the Interim RI Round 1, 2, and 3 sampling investigation. To determine if PCBs have migrated to the groundwater from the contaminated soil in the ditch adjacent to the DRMO Hazardous Waste Storage Facility, groundwater samples from two newly installed monitoring wells (17GW01, 17GW02) will be collected. The samples will be analyzed for PCBs, total petroleum hydrocarbons, and total suspended solids (TSS) to support site characterization and the risk assessment. If a floating product/waste layer is detected in the monitoring wells, additional samples will be collected and analyzed for GC fingerprinting, flashpoint, PCBs, and BTU. Figure 4-5 depicts the proposed monitoring well locations. Table 4-23 summarizes the field sampling and analysis program.

Subsurface Soils

To determine the vertical extent of soil contamination within the ditch adjacent to the DRMO Hazardous Waste Storage Facility, a total of 23 soils will be collected. The samples will be analyzed for PCBs, total petroleum hydrocarbons, and Total Organic Carbon (TOC) to support site characterization and the risk assessment. TOC is used to evaluate contaminant mobility in the soil environment. Sixteen samples will be collected at approximately a 2-foot depth; four samples will be collected on the south side of the ditch just below the surface, and three samples will be collected from just above the groundwater table, in the areas of highest contamination (the eastern section of the ditch) indicated from Round 3 sediment sampling and analysis. To evaluate remedial alternatives for the FS, British Thermal Unit (BTU) content, grain size, and density will be determined for the soils. Figure 4-5 depicts the proposed soil sampling locations. Table 4-24 summarizes the field sampling and analysis program.

Sediment

To define the extent of PCB contamination in sediments, sampling and analysis of approximately 18 sediment samples are proposed; including 2 sediment samples between the ditch and School

TABLE 4-21

SITE 17
PROPOSED SAMPLING PLAN
MCAS, CHERRY POINT, NC

Sample Matrix	Location/Depth	Number of Samples	Rationale
Groundwater	17GW01, 17GW02	2 - 1 sample per well	Evaluate the presence/ absence of PCB contamination in the groundwater.
Floating Product (optional)	May be present at locations 17GW01, 17GW02	Up to 2 samples may be collected	Evaluate the nature of contamination.
Soil	2 foot depth in ditch; just below the surface and above groundwater.	16 - Soil (2-ft. depth) 4 - Soil (surface) 3 - Soil (above groundwater)	Evaluate the extent of PCB contamination detected in earlier sampling rounds in the ditch adjacent to the Hazardous Waste Storage Facility.
Sediment	Area of ditch surface water runoff to School House Creek. Along School House Creek toward Slocum Creek.	2 - Sediment (between ditch and Schoolhouse Creek) 16 - Sediment on bank of creek	Define the extent of contamination in the sediment associated with surface water runoff. Determine if there is an impact on Slocum Creek from Hazardous Waste Storage Facility.

TABLE 4-22

SITE 17
SUMMARY OF FIELD SAMPLING AND ANALYSIS PROGRAM
MCAS, CHERRY POINT, NC

Parameter	Number of Samples[a]		
	Groundwater[b],[d] (Monitoring Wells)	Sediment	Soils
PCBs[a]	2	18	23
Total Petroleum Hydrocarbons	2	18	23
Total Suspended Solids (TSS)	2	--	--
Total Organic Carbon (TOC)	--	18	12
British Thermal Unit (BTU)	--	--	3
Grain Size	--	--	3
Density	--	--	3

(a) Number of samples does not include field QA/QC samples.
(b) pH analyses of all water samples will be conducted in the field.
(c) If floating product is encountered in any of the shallow wells, analysis shall be conducted for PCBs, BTU, flashpoint, and GC fingerprinting.

TABLE 4-23

SITE 17
LABORATORY ANALYSIS OF GROUNDWATER SAMPLES[c]
MCAS, CHERRY POINT, NC

Matrix - Water

Parameter	Analytical Method	DQO Level	Total Number of Environmental Samples	Field and/or Rinsate Blanks	Field Duplicates 1/10	Grand Total[b]
PCBs	CLP[a]	C	2	1/1	1	5
Total Petroleum Hydrocarbons	EPA 418.1	C	2	--	1	3
Total Suspended Solids (TSS)	EPA 160.2	C	2	--	1	3

(a) CLP - Contract Laboratory Program
(b) Does not include laboratory QA/QC samples.
(c) If floating product is encountered in any of the shallow wells, analysis shall be conducted for PCBs, BTU, flashpoint, and GC fingerprinting.

TABLE 4-24

SITE 17
LABORATORY ANALYSIS OF SOIL SAMPLES
MCAS, CHERRY POINT, NC

Matrix - Soil

Parameter	Analytical Method	DQO Level	Total Number of Environmental Samples	Field and/or Rinsate Blanks	Field Duplicates 1/10	Grand Total[b]
PCBs	CLP[a]	C	23	1/1	3	28
Total Petroleum Hydrocarbons	SW 3550	C	23	--	3	26
Total Organic Carbon (TOC)	SW9060/EPA 415.1	C	12	--	1	13
British Thermal Unit (BTU)	ASTM 3286	C	3	--	1	4
Grain Size	ASTM D422	C	3	--	1	4
Density	Agronomy No. 9	C	3	--	1	4

(a) CLP - Contract Laboratory Program

(b) Does not include laboratory QA/QC samples.

House Creek, in an area of surface water runoff; 1 sediment sample upstream in School House Creek; and 15 sediment samples downstream in School House Creek. Samples will be collected downstream in School House Creek every 100 feet to identify possible migration toward Slocum Creek caused by surface water runoff. Samples will be taken 2 feet perpendicular to the shoreline. Sample analysis includes PCBs, total petroleum hydrocarbons, and TOC to define extent of oily waste detected in earlier rounds and to evaluate contaminant mobility. Figure 4-5 shows the proposed sediment sampling locations. Table 4-25 summarizes the field sampling and analysis program.

Phase II

Additional sediment sampling for Schoolhouse Creek might be required if Phase I results indicate that Site 17 has contaminated Schoolhouse Creek. Analysis should be conducted for the same sample parameters as for Phase I.

4.4 TASK 4 – SAMPLE ANALYSIS AND DATA VALIDATION

4.4.1 Field Instrument Analysis

Field instrument analysis will include specific conductance, pH, Eh, dissolved oxygen, and temperature readings. These parameters are useful for fate and transport analysis. Such parameters will be measured during the purging of monitoring wells prior to sampling in order to ensure that fresh formation water is being collected. When these parameters stabilize, the samples will be collected.

4.4.2 Laboratory Analysis

Analysis of samples collected during the MCAS, Cherry Point investigation of Sites 5, 10, 16, and 17 will be performed in accordance with the approach established in subsections 3.5 and 3.6 and discussed in detail in various parts of Section 3.0 as a part of the proposed sampling and analysis activities. Sample analyses are summarized in Tables 4-5 through 4-25. The majority of analyses will be performed according to EPA's National Contract Laboratory Program (CLP) protocol. The FOP, Field Operations Plan, will provide additional details and data a quality objectives for field as well as laboratory QA/QC requirements.

TABLE 4-25

SITE 17
LABORATORY ANALYSIS OF SEDIMENT SAMPLES
MCAS, CHERRY POINT, NC

Matrix - Sediment

Parameter	Analytical Method	DQO Level	Total Number of Environmental Samples	Field and/or Rinsate Blanks	Field Duplicates 1/10	Grand Total[b]
PCBs	CLP[a]	C	18	1/1	2	22
Total Petroleum Hydrocarbons	EPA 418.1	C	18	--	2	20
Total Organic Carbon (TOC)	SW9060	C	18	--	2	20

(a) CLP - Contract Laboratory Program
(b) Does not include laboratory QA/QC samples.

4.4.3 Quality Control and Data Validation

Proper interpretation of laboratory data requires data validation, reduction, and evaluation. Through data review, the suitability, and utility of raw data can be determined. This provides valuable insight for data-sensitive evaluations such as risk assessment and modeling.

Validation of measurements is a systematic process of reviewing a body of data to provide assurance that results are adequate for their intended use. The process includes identifying deviations from specified methodologies that may affect interpretation of the data. The validation process includes the following:

- Auditing measurement system calibration and calibration verification
- Auditing quality control activities
- Screening data sets for outliers
- Reviewing data for technical credibility versus the sample site setting
- Auditing field sample data records or chain-of-custody
- Checking intermediate calculations
- Certifying previous processes

The review of laboratory data will be conducted by an NUS chemist (not associated with the laboratory) using the following EPA documents:

- USEPA, 1986. Laboratory Data Validation, Functional Guidelines for Evaluating Organic Analyses. EPA Technical Directive Document No. HQ8410-01. Hazardous Site Control Division, USEPA - OSWER, Washington, D.C., April 1985.

- USEPA, 1985. Laboratory Data Validation, Functional Guidelines for Evaluating Pesticides/PCB's Analyses. EPA Technical Directive Document No. HQ8410-01 Hazardous Site Control Division, 1985 USEPA - OSWER, Washington, D.C., 1985.

- USEPA, Laboratory Data Validation, Functional Guidelines for Evaluating Inorganic Analyses. EPA Office of Emergency and Remedial Response, USEPA - OSWER, Washington, D.C.

Several factors that will be considered are sample holding times, instrument calibration, blank results, surrogate recoveries, matrix spike/matrix spike duplicates, chain-of-custody, and any other control procedures that are applicable. The laboratory data are considered incomplete until data validation is completed.

4.5 TASK 5 – DATA REDUCTION AND EVALUATION/COMPUTER MODELING

4.5.1 Data Reduction and Evaluation

The purpose of this section is to present the methodologies by which the data discussed in Section 4.3.4 will be reduced and evaluated and subsequently used to complete the site characterization, perform the risk assessment, and develop a list of potential remedial alternatives.

Data reduction and evaluation will be initiated upon receipt of the data from the field investigation (Task 3), and after sample analyses/data validation (Task 4) is completed. The data obtained from the various field investigations will be condensed and organized to facilitate evaluation and presentation in this subtask. The data will be compared to project objectives and summarized into a usable format for data manipulation.

Reduction of hydrogeologic data will result in the production of various tables, figures, and drawings describing and summarizing the pertinent site features. These will include

- Figures displaying boring and monitoring well locations and elevations
- Various hydrogeologic cross-sections
- Well log descriptions
- Aquifer test data

Data reduction will be facilitated by computerization. The computerized sampling and analytical data base will be amenable to manipulation and creation of different sorting profiles. Sorting profiles will assist in evaluating the occurrence and distribution of contaminants within the different media. Appropriate tables, maps, and figures will be produced to summarize the occurrence and distribution of contaminants at the site and adjacent environs.

Contaminant receptors will be identified, contaminant migration pathways refined, and modeling tools will be tuned and calibrated to meet site-specific characteristics. The results of this task will be used in the risk assessment (Task 6) and in the evaluation of remedial alternatives (Tasks 7, 8, 9, and 10).

A discussion of the specific data reduction/evaluation tasks is provided in the following sections.

4.5.1.1 Hydrogeologic Data

Data collected during the hydrogeologic investigation will be used to prepare the following:

- Potentiometric surface maps for each site
- Aquifer testing results
- Hydrogeologic cross-sections for each site

The water-level measurements taken in the monitoring wells and at the staff gauges will be converted to elevations in feet relative to mean sea level.

Water-level data will be used to generate potentiometric surface maps for each site. The potentiometric surface maps will indicate groundwater flow directions and will enable hydraulic gradients to be calculated.

Results from the groundwater sampling analysis will be used to construct contaminant distribution maps. These will be used to determine horizontal and vertical contamination profiles, which will be applicable to groundwater modeling and public health assessment.

The aquifer test data will consist of slug tests. The slug test data will be evaluated by the Bouwer & Rice method (Bouwer, H., and Rice, 1976) unless other methods are more appropriate. The Bouwer & Rice method determines the aquifer hydraulic conductivity.

Hydrogeologic cross sections will be generated for each site with the data obtained from the field investigation. The various lithologies encountered during subsurface investigations will be plotted on the cross sections along with the water table and the bedrock surface. These hydrogeologic cross sections will be generated perpendicular and parallel to groundwater flow through the site.

Groundwater chemical analytical data will be validated by NUS quality assurance personnel. Statistical evaluations will be performed to evaluate contaminant distributions. These include mean, variance, and confidence levels of contaminant concentrations.

4.5.1.2 Soils

The soils data will be evaluated as the analytical data are validated. Contaminants of concern will be determined based upon risk assessment. Maps of the concentration of the contaminants of concern will be developed. The resulting maps will be used to identify areas of potential concern and to define the extent of contamination.

4.5.1.3 Surface Water and Sediments

Sediment and surface-water data will be evaluated after receipt of the analytical results and data validation. Statistical evaluations will be performed to evaluate contaminant distributions for each site. These include mean, variance; and confidence levels of contaminant concentrations.

4.5.2 Modeling of Groundwater Flow and Contaminant Transport

Computer modeling will not be included in the Phase I scope of work; however, it may be considered to evaluate the solute transport at selected sites.

Objectives of computer modeling for the aquifer system underneath the MCAS are twofold:

(1) Determine the migration and fate of the contaminants of concern in the aquifer system based on present conditions.

(2) Simulate the hydraulic response of the groundwater flow, as well as the level of contaminant concentration within the aquifer system after the employment of remedial action.

Sites 10 and 16 will most likely be selected for computer modeling because of the high levels and extent of contamination and the associated risk which may be imposed, under the given hydrogeologic conditions, on their receptors. Sites 5 and 17 will most likely not require computer modeling. If results of the RI show extensive groundwater contamination at Sites 5 and 17, computer modeling might be recommended at these sites. Also, if results of the RI show low levels of contamination at Sites 5 and 17, computer modeling may support a "no action" alternative, by providing data that will support delisting of the site.

Leachate from the Site 10 landfill has been found in Turkey Gut, one of the tributaries of Slocum Creek. Furthermore, Site 10 is the largest and probably the most significant site at the MCAS with respect to environmental impact of surface waters because both Turkey Gut and Slocum Creek are the groundwater discharge points for the groundwater system around the site. Past studies also indicate that Slocum Creek has significant influence on the local groundwater flow directions within the Site 10 area.

Similarly, the Site 16 landfill is also near Slocum Creek and its tributary, Sandy Branch. Although the landfill area is estimated to be approximately 11 acres, the actual landfill area may be greater, and other contaminant sources upgradient from Site 16 may exist as well.

Lithology for the MCAS includes sedimentary deposits at the ground surface. These coastal plain deposits are underlain at great depth by igneous and metamorphic rocks. A series of confined and unconfined aquifers formed within the sedimentary deposits are composed of sand, silt, clay, shells, and limestone. The major aquifers that may have to be considered in this modeling effort include the Surficial, Yorktown, Pungo River, and Castle Hayne. The Castle Hayne aquifer is the deepest and most productive aquifer for domestic, municipal, and industrial water uses throughout eastern North Carolina, including the MCAS. The surficial aquifer is an unconfined water-table aquifer, whereas all the others are under confined or semi-confined (Yorktown) condition.

Based on the above description, the groundwater system to be modeled consists of multi-layered aquifers which are under the influence of local area recharge and surface-water recharge.

The major contaminants to be modeled may include volatile organic compounds such as trichloroethane, toluene, benzene, vinyl chloride, and chlorobenzene; inorganics such as cyanide, arsenic, and chromium; and other organics such as PCBs. Additional chemicals can be included if required. Groundwater models will most likely be established for Sites 10 and 16. These two sites may be combined as one groundwater model, depending on the availability of offsite data.

The SWIFT-III computer code will be used to solve the governing equations for flow and contaminant transport under the boundary and initial conditions specified for each model. This code can solve the three-dimensional groundwater flow and contaminant transport equations for heterogeneous aquifer properties and an unsteady or steady-state groundwater flow condition.

The major subtasks determined for this modeling effort include the following:

- Data review
- Establishment of conceptual model
- Data manipulation and input data preparation
- Data entry and model test
- Model calibration and sensitivity analysis
- Model application
- Report preparation

General input data requirements necessary for this modeling include

- Potentiometric contours for each aquifer.
- Bottom elevation, surface area, flow of the surface water bodies.
- Hydraulic conductivity of the aquifers and aquitards.
- Effective porosity of the aquifers and aquitards.
- Geologic cross-sections.
- Groundwater recharge rate from the vadose zone.
- Total organic content of the aquifer materials.
- Isopleth of the chemical concentration in the aquifers.
- Physical boundaries of the regional/local aquifers.
- Production rate of the onsite and/or offsite pumping wells.
- Location of the contaminant sources.
- Mass loading rate of all sources.
- Monthly local precipitation
- Monthly local temperature.
- Source history.

With respect to each site or model, at least two modeling scenarios will be considered:

- No action (represents present condition).
- Remedial action (represents one remediation scheme (e.g., pump and treat)).

If other remediation schemes (e.g., groundwater barrier, reinjection) are to be considered, additional simulations would need to be developed. Based on past experience, computer runs are needed to calibrate a three-dimensional flow model and the transport model. Furthermore, computer runs are needed to conduct a sensitivity analysis for each remediation scheme. For each site (Sites 10 and 16) the Work Plan scope is based upon tracking three chemical contaminants. If the number of chemicals is increased, only the number of computer runs used to calibrate the transport model should be proportionally increased.

4.6 TASK 6 – RISK ASSESSMENT

The public health/environmental assessment will address the potential human health and environmental effects associated with Sites 5, 10, 16, and 17 by the no-action alternative. The no-action alternative assumes that no remedial (corrective) actions will take place at the site other than those actions already taken. Evaluation of the no-action alternative is required under Section 300.68 (f)(v) of the National Contingency Plan (NCP). By conducting such an assessment, the MCAS will be able to determine whether remedial actions are indicated for any area of the site.

The first step in the public health/environmental assessment is the review of the results of the environmental sampling and other information developed during the RI to identify chemicals of potential concern for detailed study during the risk assessment. A key element in this screening process is a comparison of site concentrations of contaminants to background levels of these chemicals in appropriate media; naturally occurring chemicals present at background concentrations may not be considered to be site-related and will not be evaluated in the assessment. In addition, chemicals present in blanks at similar concentrations (i.e., laboratory and field contaminants) will not be selected for the detailed analysis. Depending on the number of chemicals detected at the site, selection of a subset of chemicals, referred to as the chemicals of concern or indicator chemicals, may not be necessary. If the selection is needed, relative concentration, mobility, persistence, and toxicity of the contaminants in the environmental samples taken at the site will be considered.

Previous sampling of environmental media conducted by the MCAS and NUS Corporation indicates that volatile organics are predominant contaminants of concern at the MCAS Sites 5, 10, and 16. PCBs are contaminants of concern at Sites 5 and 17. Onsite contamination of groundwater, surface water, soil, and/or sediments by volatile organic compounds (e.g., TCE), and/or PCBs has been documented.

The chemicals noted above will be included as chemicals of concern for the site along with any other chemicals associated with adverse public health or environmental impacts.

The second step in the public health/environmental assessment is the identification of actual or potential routes of exposure and the characterization of the probable magnitude of exposure to human or environmental receptors.

The following potential exposure pathways may be important under current or future land use at the four MCAS sites under consideration:

- Groundwater
  - Ingestion of contaminated groundwater
  - Inhalation of volatiles released from the groundwater
  - Skin absorption of groundwater contaminants

- Surface water
  - Ingestion of contaminated surface water
  - Skin absorption of surface water contaminants
  - Consumption of contaminated fish

- Soils/Sediments
  - Direct contact
  - Accidental ingestion

- Air
  - Inhalation of airborne contaminants migrating off site

The surface water exposure pathways are the primary human exposure pathways of concern at the MCAS Sites.

For each exposure scenario, concentrations in relevant environmental media (air, surface water, groundwater, soil, and sediments) at the potential receptor locations will be identified. Where concentrations have not been measured at the exposure point, estimates of current concentrations may, in certain instances, be made using models. These models should not be confused with the computer modeling of Section 4.5.2. The choice of models will be based on the sampling results. They may be simple partitioning models to determine release from soil or water to another medium (e.g., air) or more complex transport models. It is not possible to identify the specific models that may be selected here, since it is not known what the data will reveal about the distribution of chemicals from the site. Should the modeling become necessary, the appropriate models will be selected from the available literature (i.e., EPA publications and reviewed journals). All models and assumptions will be documented in the report and supplemented with appendices.

Chemical intakes for each human exposure scenario will be estimated based on frequency and duration of exposure and rate of media intake (e.g., amount of water ingested per day). Human exposure is expressed in terms of intake, which is the amount of a substance taken into the body per unit body weight per unit time. A chronic daily intake (CDI) is averaged over a lifetime for carcinogens (USEPA, 1987) and over the exposure period for noncarcinogens (EPA, 1987). The CDI is calculated separately for each exposure pathway, since different populations-at-risk may be affected by the individual pathways. The assumptions used in these estimates will be stated clearly and thoroughly documented. The assumptions will be selected to represent "plausible" and "worst case" exposure scenarios. The exposure of nonhuman receptors will be estimated based on the sampling results or, if necessary, on the use of appropriate models that have appeared in the literature.

The third step in the public health/environmental assessment is the toxicity assessment, which identifies the critical toxicity values for each chemical of potential concern.

For humans, toxicity data will be presented in the following forms:

- For carcinogens, the carcinogenic potency factor, in the units mg/kg/day.

- For noncarcinogens, the estimated risk reference dose (Rfd) (formerly called acceptable daily intake [ADI]) in the units mg/kg/day.

- For chemicals for which no critical toxicity values are available, a semiquantitative characterization based on any pertinent information that is available (e.g., subchronic toxicity studies or structural analogies). The basis for any toxicity values developed by NUS Corporation for this assessment will be included as an appendix.

For environmental receptors the available literature will be reviewed and environmental contaminant concentrations that have been associated with adverse effects in field or laboratory studies will be compared to the contaminant concentrations found in affected surface-water bodies. Limited data may be available on environmental effects of some of the MCAS chemicals of concern. The toxic potential will be evaluated in a semiquantitative manner.

In addition to critical toxicity values, any Applicable or Relevant and Appropriate Requirements (ARARs) that have been established for the potential chemicals of concern will be identified. Currently, EPA considers MCLs and MCLGs developed under the Safe Drinking Water Act, Federal Ambient Water Quality Criteria (AWQC), National Ambient Air Quality Standards (NAAQS), and State environmental standards to be potential ARARs for use in risk assessment at Superfund sites.

Finally, the potential adverse effects on human health are assessed, where possible, by comparing contaminant concentrations found at or near the site with the Applicable or Relevant and Appropriate Requirements (ARARs) previously identified. However, if a suitable ARAR is not available for a chemical of concern or for the exposure scenarios considered, a quantitative risk assessment must also be performed.

The evaluation of noncarcinogenic health risks associated with contaminants of concern considered in this report is based primarily on a comparison of the estimated daily intake of the indicator chemicals with appropriate critical toxicity values for the protection of human health described above. For potential carcinogens, the estimated cancer risks associated with exposure are calculated using EPA-derived cancer potency factors. Specifically, excess lifetime cancer risks are obtained by multiplying the cancer potency factor by the average daily intake of the contaminant under consideration. This procedure is considered to be appropriate for low doses, such as would potentially result from this site. In this assessment, the effects of exposure to each of the contaminants under the scenarios evaluated will initially be considered separately.

However, contaminants occur together, and individuals may be exposed to a mixture of the contaminants. Consequently, it is important to recognize the potential adverse effects (i.e., synergistic effects) that these mixtures can have in humans. Suitable data are not available to characterize the effects of chemical mixtures potentially present at or near the MCAS sites. As suggested in EPA guidance (USEPA, 1987) for evaluating mixtures, however, the excess cancer risks can be added to calculate hazard indices.

Risk assessments will be conducted separately for each exposure pathway and for each source, when appropriate. Results will be presented separately for the "average exposure case" and the "plausible maximum case" exposure assumptions. The risk assessment for each exposure pathway will include a discussion of the uncertainties in the estimates.

Ecological risk assessment is a process for assessing the probability or likelihood of adverse effects on the environmental or on some specific component or population. Information on environmental toxicity properties of contaminants, or standards such as the Ambient Water Quality Criteria, will be combined as available with estimates of environmental exposure levels to derive estimates of risk to environmental populations.

For environmental receptors, environmental concentrations that have been associated with adverse effects in field or laboratory studies may be identified, when available.

Risk assessments will be conducted separately for each exposure pathway and for each source, when appropriate. Results will be presented for the "plausible" and "worst case" exposure assumptions. The risk assessment for each exposure pathway will include a discussion of the uncertainties in the estimates.

4.7 TASK 7 – TREATABILITY STUDY/PILOT TESTING

Treatability study/pilot testing will not be included in the Phase I Scope of Work.

Bench- and pilot-scale studies will not be performed on selected source-control technologies. Instead, these studies will be conducted, if necessary, after completion of the RI/FS.

The four sites in question do not clearly require treatability testing in support of the RI/FS at this time. Groundwater remediation alternatives can be developed from existing data and data collected during proposed RI activities. Soils also require remediation alternatives; however, because of the nature of the four sites, treatability testing in support of the FS may not be required, and/or it would be difficult to estimate the associated level of effort (LOE) for this fixed-price contract. Existing data and data collected during proposed RI activities should be sufficient for preparing the FS alternatives. The volumes of PCB-contaminated soil at Site 5 and Site 17 may favor offsite disposal or incineration as a remediation response. Sites 10 and 16 are large landfills contaminated with both organics and inorganics. Physical containment or disposal of "hot spot" areas are likely remediation responses.

If, during the RI/FS preparation, it is determined that a bench-scale treatability study is necessary for one of the sites, scope will be developed for this task. As technologies are screened, bench-scale testing may be recommended, based on a more detailed evaluation of technologies identified herein or additional technologies beyond those already identified.

The process of implementing this task, if necessary, would involve two steps. In the first step, NUS would

- Develop specifications for vendors for performing bench-scale treatability studies.
- Evaluate the bids received, recommend vendors, and develop cost estimates for implementing these bench-scale studies.
- Provide the Department of the Navy cost estimates of implementing the treatability studies and prepare an amendment to the work plan (as required).

Under the second step of this task, NUS would

- Manage the implementation of the bench-scale studies.
- Recommend technologies to be evaluated under field pilot studies (if necessary), based on the results of their performance evaluation.
- Perform field pilot studies work plan/specification preparation and vendor submittal (may be different from bench-scale testing vendors). Review vendor bids.
- Notify vendors of their selection to participate in field pilot studies.
- Manage the implementation of the pilot-scale field studies.
- Obtain results of field studies and evaluate vendors for their technical and engineering performance to meet cleanup objectives.
- Prepare an evaluation document delineating candidate technologies suitable to meet the cleanup objective for the site considering health, environmental, engineering, and economic factors. This document will provide a summary of costs and treatments achieved for each of the technologies evaluated.

It is emphasized that this task is not within the scope of this Work Plan. Should it become necessary to implement this portion of the program prior to completion of the RI/FS, the specific testing required will be developed at that time.

4.8 TASK 8 – REMEDIAL INVESTIGATION (RI) REPORT

The RI report will summarize the data collected and the conclusions drawn from the investigation for each of the four sites under consideration. The material that will be presented will include the following:

- Site description and history
- Topographic and property maps
- Subsurface investigation results
- Permeability testing results

- Chemical analysis results
- Results of the risk assessment

Separate reports will be required for Phase I and Phase II work.

Project status meetings are scheduled following EPA and Department of the Navy review of the RI report.

4.9 TASK 9 – REMEDIAL ALTERNATIVES SCREENING

Remedial alternatives screening will not be included in the Phase I Scope of Work.

The objective of this task is to refine the range of response actions developed during the scoping process (Task 1). The alternatives will be screened using a defined set of criteria. Only those alternatives which pass the initial screening process will undergo full evaluation.

The results of this task will provide the basis for recommending treatability studies/pilot testing (if necessary). The subtasks comprising Task 9 will accomplish the following objectives:

- Development of remedial response objectives and General Response Actions.
- Identification of applicable technologies and assembly of alternatives.
- Screening of remedial technologies/alternatives, including recommendations for bench/pilot testing (if necessary).

4.9.1 Development of Remedial Response Objectives and Response Actions

Based on the data collected in the RI, the remedial response objectives will be developed more fully. Specific response objectives will be developed using a risk-based methodology to define cleanup levels that would reduce risks to public health and the environment to acceptable levels (this includes ARARs considerations). Potential contaminant migration pathways, exposure pathways, and ARARs identified in the risk assessment will be examined further as a basis for estimating acceptable onsite residual contamination levels. Acceptable exposure levels for potential receptors will be identified and onsite cleanup levels will then be estimated by extrapolating from receptor points back to source areas along critical migration pathways. Development of response objectives will also include refinement of ARARs specific to each of the four sites.

4.9.2 Identification of Applicable Technologies and Assembly of Alternatives

Based on the remedial response objectives, a list of applicable technologies will be identified. The technologies list will contain those previously identified in Section 3.4. After potential remedial technologies have been selected, operable units will be defined for each site condition requiring remediation. Each operable unit should meet at least one response objective.

After operable units have been defined, remedial alternatives will be identified. Each remedial alternative will be an overall site remedy. The no-action alternative will be considered a baseline against which the other alternatives can be evaluated.

CERCLA, as amended by SARA, states that, to the maximum extent practicable, remedial actions that utilize permanent solutions and alternative treatment technologies or resource recovery technologies must be selected. Therefore, remedial actions that use these technologies will specifically be considered for Task 7. To the extent possible, treatment options will range from alternatives that eliminate the need for long-term management at the site to alternatives involving treatments that would reduce toxicity, mobility, or volume as a principal goal.

4.9.3 Screening of Remedial Technologies/Alternatives

The lists of technologies and alternatives developed will be screened. The objective of this effort is to eliminate from further consideration any technologies and alternatives that are undesirable regarding implementability, effectiveness, and cost. The list of alternatives being considered will be narrowed by eliminating the following types of technologies.

- Technologies/alternatives that are not implementable or technically inapplicable.

- Technologies/alternatives that are not effective because they have adverse environmental impacts, do not provide adequate protection of public health, or do not attain ARARs.

- Technologies/alternatives which are more costly than other alternatives/technologies but do not provide greater environmental or public health benefits, reliability, or a more permanent solution. Costs will not be used to discriminate between treatment technologies and nontreatment technologies.

Reasons for elimination of any alternative at this stage will be documented in the FS report.

A meeting with the Department of the Navy will be held following NUS' screening of remedial technologies/alternatives to obtain input to the screening process.

4.10 TASK 10 – REMEDIAL ALTERNATIVES EVALUATION

Remedial alternatives evaluation will not be included in the Phase I Scope of Work.

Remedial alternatives that pass the initial screening process (Task 9) will be further evaluated and compared, as required in the NCP and in CERCLA, as amended by SARA. Criteria used in evaluating the remedial alternatives will be those nine established in OSWER Directive 9355.0-21, approved July 24, 1987, which include

- Compliance with ARARs.
- Reduction of mobility, toxicity, or volume.
- Short-term effectiveness.
- Long-term effectiveness and permanence.
- Implementability.
- Cost.
- Community acceptance.
- State acceptance.
- Overall protection of human health and the environment.

To the extent possible, remedial alternatives that use permanent solutions and alternative treatment technologies will be considered.

<u>Compliance with ARARs</u>

Alternatives will be assessed as to whether they attain legally applicable or relevant and appropriate requirements or other Federal and State environmental and public health laws, including, as appropriate:

- Contaminant-specific ARARs (e.g., MCLs, NAAQS).
- Location-specific ARARs (e.g., restrictions on actions at historic preservation sites, or in flood plains).
- Action-specific ARARs (e.g., RCRA requirements for incineration and closure).

Reduction of Toxicity, Mobility, or Volume

The degree to which alternatives employ treatment that reduces toxicity, mobility, or volume will be assessed. Factors that are relevant include:

- The treatment processes, the remedies employed, and materials they will treat.
- The amount of hazardous materials that will be destroyed or treated.
- The degree of expected reduction in toxicity, mobility, or volume.
- The degree to which the treatment is irreversible.
- The residuals that will remain following treatment.

Short-term Effectiveness

The short-term effectiveness of alternatives will be assessed considering appropriate factors among the following:

- Magnitude of reduction of existing risks.
- Short-term risks that might be posed to the community, workers, or the environment during implementation of an alternative.
- Time until full protection is achieved.

Long-term Effectiveness and Permanence

Alternatives will be assessed for the long-term effectiveness and permanence they afford along with the degree of certainty that the remedy will prove successful. Factors to be considered are:

- Magnitude of residual risks in terms of amounts and concentrations of waste remaining following implementation of a remedial action.

- Type and degree of long-term management required, including monitoring and operation and maintenance.

- Potential for exposure of human and environmental receptors to remaining waste.

- Long-term reliability of the engineering and institutional controls, including uncertainties associated with land disposal of untreated wastes and residuals.

- Potential need for replacement of the remedy.

Implementability

The ease or difficulty of implementing the alternatives shall be assessed by considering the following types of factors:

- Degree of difficulty associated with constructing the technology.
- Expected operational reliability of the technologies.
- Need to coordinate with and obtain necessary approvals and permits (e.g., NPDES, Dredge and Fill Permits for offsite actions) from other offices and agencies.
- Availability of necessary equipment and specialists.
- Available capacity and location of needed treatment, storage, and disposal services.
- Need to respond to other sites (§104 actions only).

Cost

The types of costs that will be assessed include the following:

- Capital costs.
- Operation and maintenance costs.
- Costs of 5-year reviews, where required.
- Net present value of capital and O&M costs.
- Potential future remedial action costs.

For each alternative, the cost will be estimated within a range of –30 percent to +50 percent. The cost analysis will include separate evaluation of capital and operation and maintenance costs. Capital costs will consist of short-term installation costs such as engineering/design fees, materials and equipment, construction, and offsite treatment or disposal. Operation and maintenance costs will consist of long-term costs associated with operating and monitoring the remedial actions. Capital and annual operation and maintenance costs will be based on the anticipated time necessary for the alternative to achieve cleanup criteria.

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A discount rate of 10 percent will be assumed for all present-worth calculations. Cost estimates will be prepared using data from project files, the current EPA Remedial Action Costing Procedures Manual, USEPA technical reports, and quotations from equipment vendors. Equipment replacement costs will be included when the required performance period exceeds equipment design life.

Community Acceptance

This assessment will attempt to look at the following elements:

- Components of the alternatives that the community supports.
- Features of the alternatives for which the community has reservations.
- Elements of the alternatives that the community strongly opposes.

State Acceptance

It may be appropriate to consider incorporating the state's concerns into the evaluation with regard to:

- Components of the alternatives the state supports
- Features of the alternatives for which the state has reservations
- Elements of the alternatives under consideration that the state strongly opposes

Overall Protection of Human Health and the Environment

Following the analysis of remedial options against individual evaluation criteria, the alternatives will be assessed from the standpoint of whether they provide adequate protection of human health and the environment.

4.11 TASK 11 – FEASIBILITY STUDY REPORT

The Feasibility Study report will not be included in the Phase I Scope of Work.

Task 11 will consist of the following subtasks:

- Summarize each alternative in terms of the nine criteria mentioned above
- Compare the remedial alternatives
- Prepare the FS report

The FS report for the Department of the Navy, Cherry Point, Sites 5, 10, 16, and 17, will include an executive summary, an introduction, a description of the technologies considered, the screening and evaluation process, a summary of the detailed technical and cost evaluations, and a comparative evaluation of the remedial alternatives. This summary will be presented as table matrices. Backup information and calculations will be included as appendices.

If Task 12 is requested as a component of the RI/FS, the final FS report will include a responsiveness summary and the selected remedy.

4.12 TASK 12 – POST-RI/FS SUPPORT

Post RI/FS support will not be included in the Phase I Scope of Work.

NUS will provide support to the Department of the Navy for any requested assistance in activities that occur after the Department of the Navy, Cherry Point Sites 5, 10, 16, and 17 RI/FS is completed. Currently the scope of this task is limited to preparation of a responsiveness summary, ROD support, and project closeout. Additional scope for this effort, if needed, will be determined in meetings with the Department of the Navy after the RI/FS report is approved and follow-up actions are identified. Additional support may include assistance in preparing the Record of Decision or Responsiveness Summary.

4.13 TASK 13 – ENFORCEMENT SUPPORT

Enforcement support will not be included in the Phase I Scope of work.

This task includes efforts during the RI/FS associated with enforcement actions in support of civil complaints against a Responsible Party. The fact that the Department of the Navy is the Responsible Party voluntarily conducting RI/FS activities (i.e., the four sites are not currently on the National Priority List [NPL] for Superfund work) this task is not applicable. Task 13 is not included as part of this Work Plan.

4.14 TASK 14 - MISCELLANEOUS SUPPORT

The objective of this task is to perform work which is associated with the RI/FS scope of work but that is not considered a routine part of the RI/FS. Task 14 is not anticipated to be necessary at this time and so has not been included as part of this Work Plan.

4.15 TASK 15 - ERA PLANNING

This task is to be used specifically for planning expedited response actions (ERAs). At this time, there are no plans to implement an ERA for any of the four sites; therefore, this task has not been included as part of this Work Plan.

5.0 PROJECT MANAGEMENT APPROACH

5.1 ORGANIZATION AND APPROACH

The proposed project organization for the Department of the Navy, Cherry Point Sites 5, 10, 16, and 17 RI/FS is shown in Figure 5-1. The Program Manager, Ms. Vicki Bomberger, is responsible for the quality of all work performed for the Department of the Navy. Ms. Debra Wroblewski will serve as the Project Manager (PM). The PM has primary responsibility for implementing and executing the RI/FS. Supporting the PM are the Field Operations Leader (FOL) and other technical support staff. The FOL is responsible for the onsite management of activities for the duration of the site investigation.

The RI/FS tasks included in this Work Plan, in addition to the budget (to be provided upon both EPA approval of the Work Plan and request from the Department of the Navy), compose the baseline plans. These plans form an integrated management information system against which work assignment progress can be measured. The baseline plans are a precise description of how the work assignment will be executed in terms of scope, schedule, and budget.

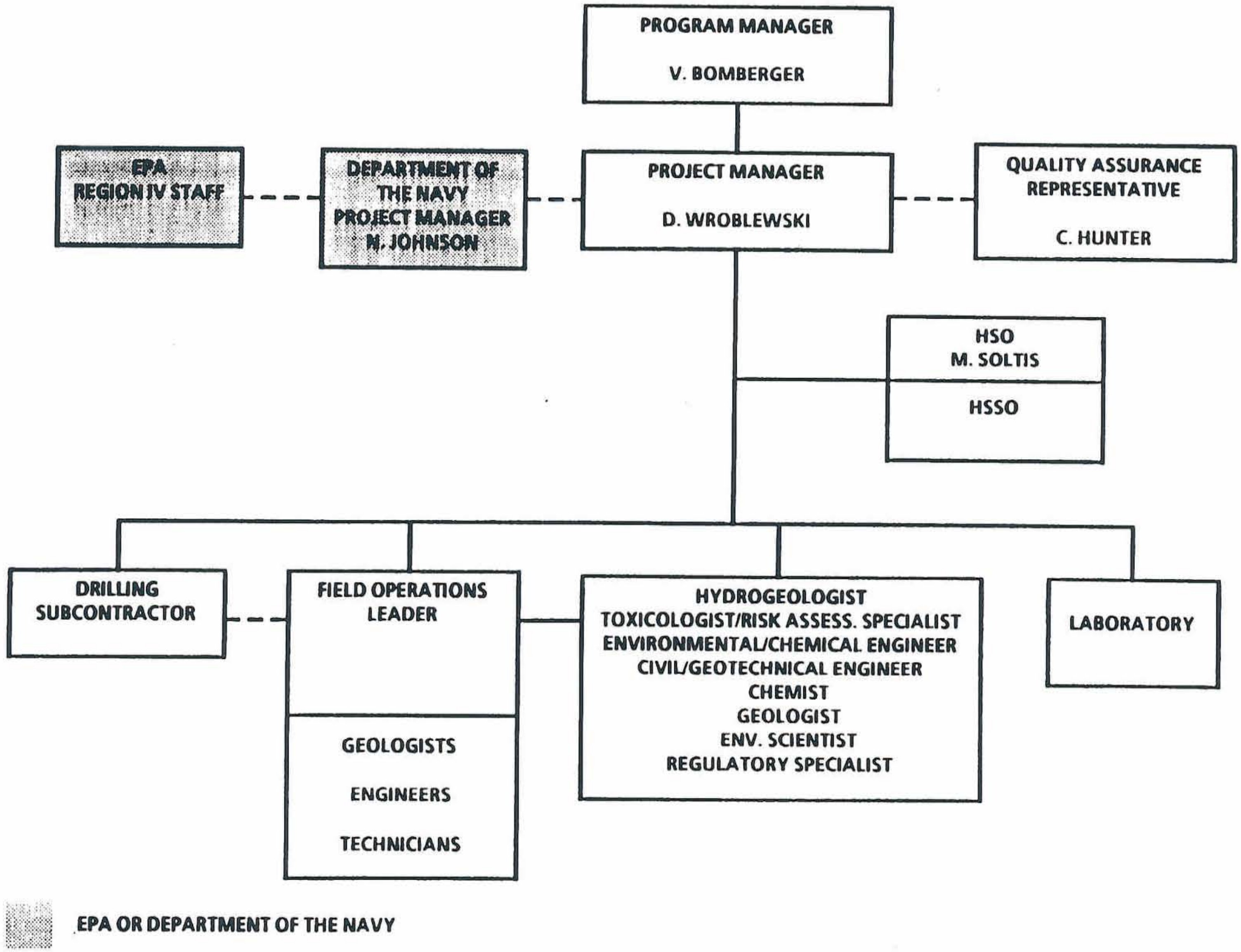
5.2 QUALITY ASSURANCE AND DATA MANAGEMENT

The site-specific quality assurance requirements will be in accordance with the Quality Assurance Requirements Manual (QARM) developed by NUS, except where superceded by the Navy document entitled Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program (Naval Energy and Environmental Support Activity, June 1988). Requirements contained with the QARM conform to the provisions of the NUS Corporate QA Policy.

The two divisions of NUS which will be involved with the RI/FS work are the Waste Management Services Group (WMSG) and the Laboratory Services Group (LSG); both divisions will operate in accordance with the QARM, in order to control work product quality.

The QARM establishes general guidance on project organization and responsibility as well as QA objectives for measurement of data in terms of precision, accuracy, representativeness, completeness, and comparability. The basic six requirements are summarized in the following table.

FIGURE 5-1
PROJECT ORGANIZATION
MCAS, CHERRY POINT, NC



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Basic Requirement	Objective
Standard Operating Procedures (SOPs)	Identify methods to be followed for implementing project work.
Project Work Plans	Clearly define site-specific contract requirements, such as technical scope of work, costs, schedule, quality provisions, and management requirements.
Product Review	Ensure that the work product accurately reflects input data, complies with project requirements, and is clearly understood and technically accurate.
Program Training	Ensure that WMSG and LSG personnel assigned to the project are familiar with the requirements of the QARM and applicable SOPs.
Program Monitoring	Ensure compliance with WMSG, LSG, and Corporate QA requirements.
Records Management	Provide complete, recoverable documentation for technical reference, project control, problem solving, quality assurance, and possible resolution of disputes.

To implement project work, a variety of technical and administrative Standard Operating Procedures (SOPs) have been developed. Examples of SOPs include health and safety procedures, environmental sampling, boring log preparation, well installation, QA auditing, and procurement procedures. Many SOPs, particularly field and laboratory procedures, were prepared in accordance with EPA-approved procedures.

5.3 PROJECT SCHEDULE

The project schedule for implementation of this work plan is included in the Task III Report: Work Plan.

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